

COMPUTING FOR BUSINESS AND HOME

# INTERFACE AGE™

APRIL 1982

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7/4

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They Add Up?

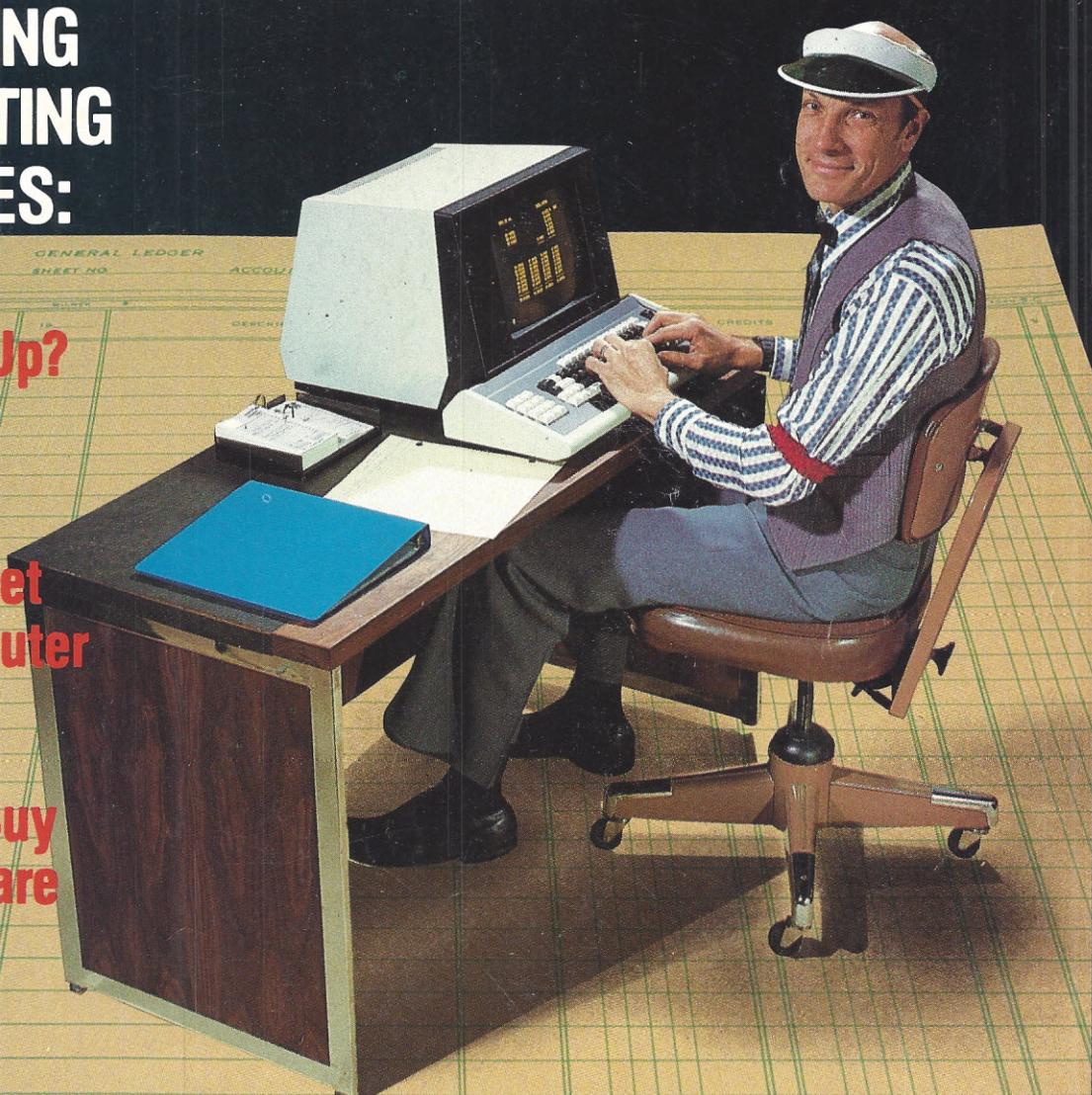
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# THINKING MULTIPROCESSING? THINK TELETEK'S SBC-1

**Teletek's SBC-1** is designed to be implemented in a high-performance S-100 multiprocessing system. With its own CPU, serial ports, parallel ports, CTC, 128k of segmented memory and 1k or 2k FIFO, the SBC-1 is the most powerful S-100 slave processor available today.

- System may run at 4MHz with SBC-1 running at 6MHz
- Z80A or Z80B processor
- Two serial ports
  - RS232 port with software selectable speeds
  - RS422 port for high-speed communications
  - communication to a synchronous modem
- CTC provides counter/timer outputs available to the user
- 128k of segmented memory partitioned into 4k segments which can be dynamically addressed on any 4k boundary of the CPU address space
- 2k, 4k, or 8k of EPROM for initialization routines (may be disabled after completion of routines)
- 1k or 2k FIFO allows efficient communication to the bus master
- Two parallel ports
- Three levels of reset are possible
- As many as 20 SBC-1s may be in use simultaneously
- Digital Research or Infosoft operating systems available

## TELETEK

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New Cromemco System One shown with our high-capability terminal and printer.

# A new small computer that won't limit you tomorrow

Here's a low-priced computer that won't run out of memory capacity or expandability halfway through your project.

Typically, computer usage tends to grow, requiring more capability, more memory, more storage. Without a lot of capability and expandability, your computer can be obsolete from the start.

The new System One is a real building-block machine. It has capability and expandability by the carload.

Look at these features:

- Z80-A processor
- 64K of RAM
- 780K of disk storage
- CRT and printer interfaces
- Eight S-100 card slots, allowing expansion with
  - color graphics
  - additional memory
  - additional interfaces for telecommunications, data acquisition, etc.
- Small size

## GENEROUS DISK STORAGE

The 780K of disk storage in the System One Model CS-1 is much greater than what is typically available in small computers.

But here, too, you have a choice since a second version, Model CS-1H, has a 5" Winchester drive that gives you **5 megabytes** of disk storage.

## MULTI-USER, MULTI-TASKING CAPABILITY

Believe it or not, this new computer even offers multi-user capability when used with our advanced CROMIX® operating system option. Not only does this outstanding O/S support multiple users on this computer but does so with powerful features like multiple directories, file protection and record level lock. CROMIX lets you run multiple jobs as well.

In addition to our highly-acclaimed CROMIX, there is our CDOS\*. This is an enhanced CP/M<sup>†</sup> type system designed for single-user applications. CP/M and a wealth of CP/M-compatible software are also available for the new System One through third-party vendors.

## COLOR GRAPHICS/WORD PROCESSING

This small computer even gives you the option of outstanding high-resolution color graphics with our Model SDI interface and two-port RAM cards.

Then there's our tremendously wide range of Cromemco software including packages for word processing, business, and much more, all usable with the new System One.

## ANTI-OBSOLESCENCE/LOW-PRICED

As you can see, the new One offers you a lot of performance. It's obviously designed with anti-obsolescence in mind.

What's more, it's priced at only \$3,995. That's considerably less than many machines with much less capability. And it's not that much more than many machines that have little or nothing in the way of expandability.

Physically, the One is small — 7" high. And it's all-metal in construction. It's only 14 $\frac{1}{8}$ " wide, ideal for desk top use. A rack mount option is also available.

## CONTACT YOUR REP NOW

Get all the details on this important building-block computer. Get in touch with your Cromemco rep now. He'll show you how the new System One can grow with your task.

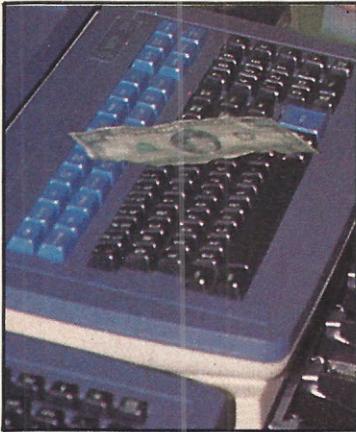
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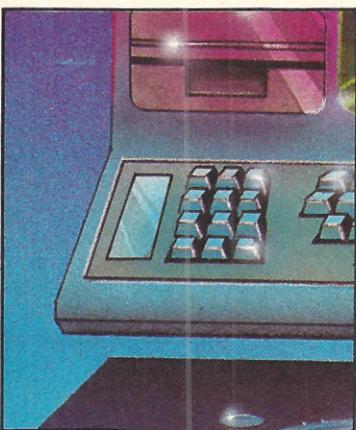


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The Retail Market  
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Word Processors  
for the TRS-80 ..... 76



General Ledger Software  
in the Balance ..... 84

Cover model: Bob Jackson



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# INTERFACE AGE™

COMPUTING FOR BUSINESS AND HOME APPLICATIONS

## FEATURES

<b>Assignment: Benchmark/Wang 2200SVP</b> .....	by Hillel Segal	54
Enhanced system in the 2200 line. ....		
<b>Hardware Evaluation: Epson MX-100 Printer</b> .....	by Roger H. Edelson	56
Full-sized and full-featured addition to printer line. ....		
<b>System of the Month: Dynabyte 5055</b> .....	by Tom Fox	62
Mini-Winchester drive highlights this system. ....		
<b>The Retail Market Goes Computer</b> .....	by Terry Benson	68
A look at computer applications for retail outlets. ....		
<b>Word Processing Software</b> .....	by David D. Busch	76
Comparison of programs for the TRS-80. ....		
<b>Business Software Forum: General Ledger Software</b> .....	by Carl Heintz	84
Balancing the features of several GL packages. ....		
<b>Data Base Managers: Four for the Apple</b> .....	by Voyle A. Glover	96
Reviewing four DBMS programs. ....		
<b>CalcStar: Good Grades for Flexibility</b> .....	by Rocky Smolin	102
Latest VisiCalc-like program scores high marks. ....		
<b>Multiprocessor Networks</b> .....	by Bernard Conrad Cole	114
Is the multi-microprocessor a viable alternative to the mainframe? ....		
<b>Negotiating for your Software</b> .....	by Reginald D. Gates	118
How to ensure a successful custom software contract. ....		
<b>Where to Buy your Software</b> .....	by Louis E. Frenzel, Jr.	122
Discussing sources for software selection. ....		
<b>Software Review: Sorcim's SuperCalc</b> .....	by Alan R. Miller	126
Evaluating another VisiCalc-like program for CP/M. ....		

## COLUMNS

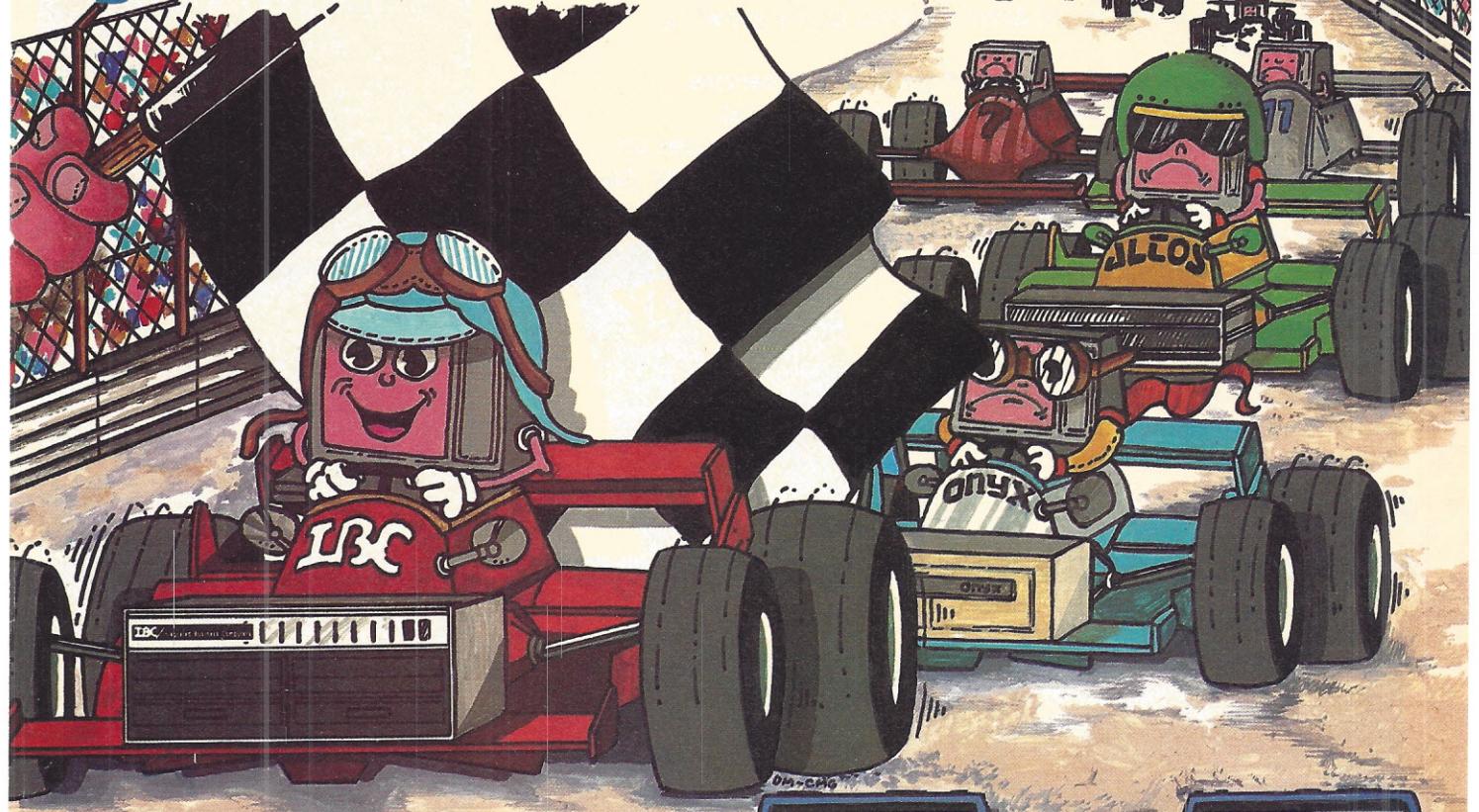
<b>Game Corner:</b> Fog index revisited .....	22
<b>Inventor's Sketchpad:</b> Flat panel display with depth .....	24
<b>Micro Mathematician:</b> Business forecasting .....	34
<b>Learning with Micros:</b> IBM in the educational market .....	42
<b>Apple-ications:</b> Word processing language .....	44
<b>Commodore Logbook:</b> VisiCalc applications .....	48
<b>Power in your Pocket:</b> Peek at the Panasonic .....	52

## DEPARTMENTS

<b>Editor's Notebook</b> .....	6	<b>New Products</b> .....	128
<b>Letters to the Editor</b> .....	11	<b>Calendar</b> .....	140
<b>Update</b> .....	18	<b>Book Reviews</b> .....	142
<b>New Literature</b> .....	146		

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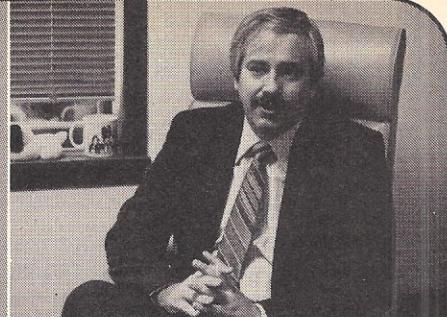
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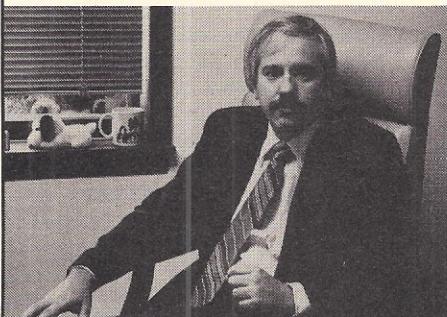


*"People are beginning to realize that the InfoSoft operating system has some real advantages," says Tom Hayes, Manager of*

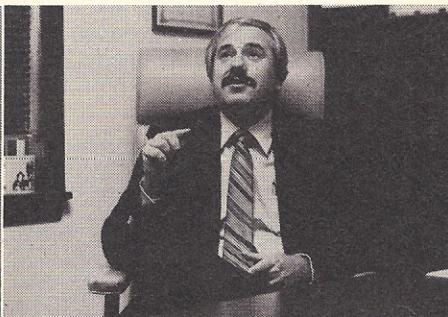
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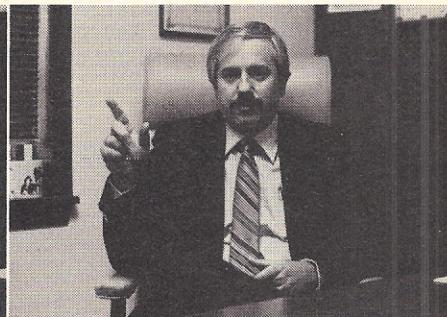
*I/OS, InfoSoft's single user system. It has extended system calls and the ability to support a far wider range of devices than CP/M®*



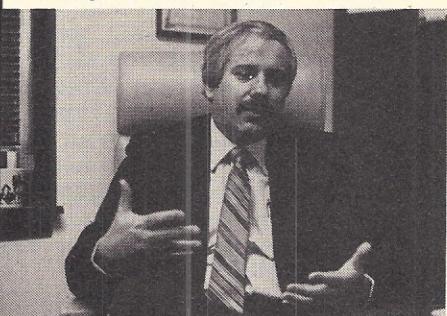
*We've contracted with InfoSoft to develop an operating system for network as well. We'll be using our META 4/1000 8-bit machine*



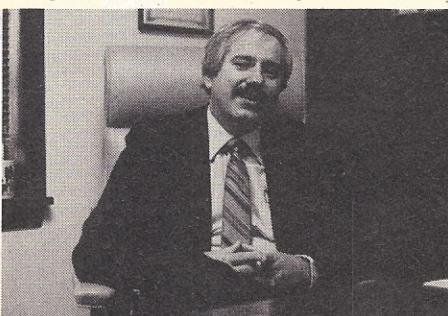
*and be able to hook up anywhere from 6 to 16 users. The whole system will be ready to go before the end of the year. I've used*



*both CP/M and I/OS, and I/OS is much more user-friendly and easier to use. We have no problems packaging the InfoSoft*



*system with our machines because it will run virtually anything that will run under CP/M, and once we've clearly laid out the advan-*



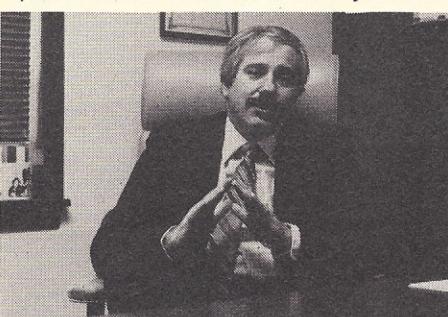
*tages, our dealers and users know it's better. Certainly the high end growth in the computer business over the next 5 years is*



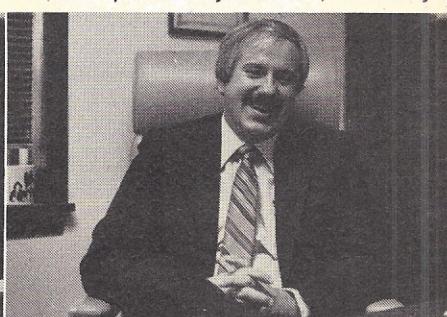
*going to be in small machines. A network of micros will allow many small businesses to boost productivity. However, it is very*



*important to present the businessman with a complete turnkey package. He doesn't have, nor does he want to have, the expertise*



*to determine what pieces he needs. So, we give him a machine that makes service easy, an operating system with broad*



*capabilities like those designed by InfoSoft, and all the applications software, all wrapped up in one easy-to-use package."*

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# EDITOR'S NOTEBOOK

## Viva Las Vegas

The present recession is supposed to be the first one that has significantly affected Las Vegas, but when this year's International Winter Consumer Electronics Show (CES) came to Las Vegas, the recession apparently took the weekend off. Well over the originally estimated 60,000 attendees paraded through not just the Las Vegas conven-

tion center, but also the Hilton Hotel and the Jockey Club Hotel. With the 25th CES being the largest convention to hit Las Vegas, the already large convention center could not contain the wizardry of electronics that has become the way of life for the American consumer.

With almost 1,000 exhibitors spread throughout the three areas and with overflow capacity at the convention itself, it was difficult to visit the booths in which

we had primary interest, let alone see all of the exhibits. In wandering through the show, we detected that there must have been an unannounced theme: video. There were video accessories, cassettes, disk players, recorders, video games and, yes, even home computers.

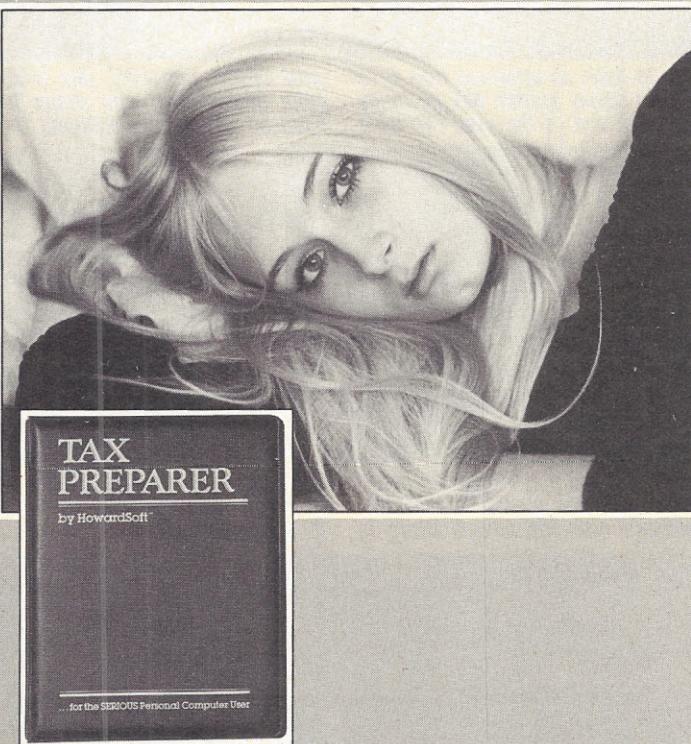
In a glamour town like Las Vegas, we fully expected to see dancing girls and flashing lights...but not! These were replaced with TV screens. The major promoter of this concept had to have been JVC with 65 TVs simultaneously displaying a music concert by some current popular singers. Next in line for multi-screens was Magnavox with 58 TVs. Overall, Sony has to be the winner of the show in terms of numbers of TV sets—and the Sony TV division didn't even have an exhibit. The Sonys were used by other manufacturers to display more than 100 video games.

In addition to these electronic arcade games, several manufacturers were demonstrating the newer home computer systems. Atari and Mattel each had over 40 operating games and all had lines of people waiting to play—and these were adults. It appears that the game market for the microcomputer products is going to help proliferate the use of these new electronic marvels in the home for both children and adults. This certainly can't be all bad.

Two of the companies fighting for this home computer market are Commodore with its expanded line of Vic 20 products and a new low cost Ultimax. This \$150 unit will be offered in direct competition with Atari and Mattel, but the Ultimax offers complete computing capability in addition to the expected games. The Commodore 64 (\$595) is an advanced home computer to compete with the Atari 800—and maybe even the Apple II. Mattel, on the other hand, is finally offering the long-awaited keyboard component. Originally introduced in late 1979 (IA Aug/Sept 79), it uses the master component, or game module, as the primary controller to provide a complete home computer system. At \$500, the cost of the keyboard component will be over twice the originally suggested price two years ago. It is presently being test-marketed in five cities, and it will take several more months to assess the market acceptance. It seems Mattel is finally on the right track.

It looks like the easiest way to get a computer accepted into the home is to offer it to the game players who aren't always just the children. Of course, there'll be some who claim that the video-game-turned-computer is useless. But if this is the only way to get the

## RELAX!



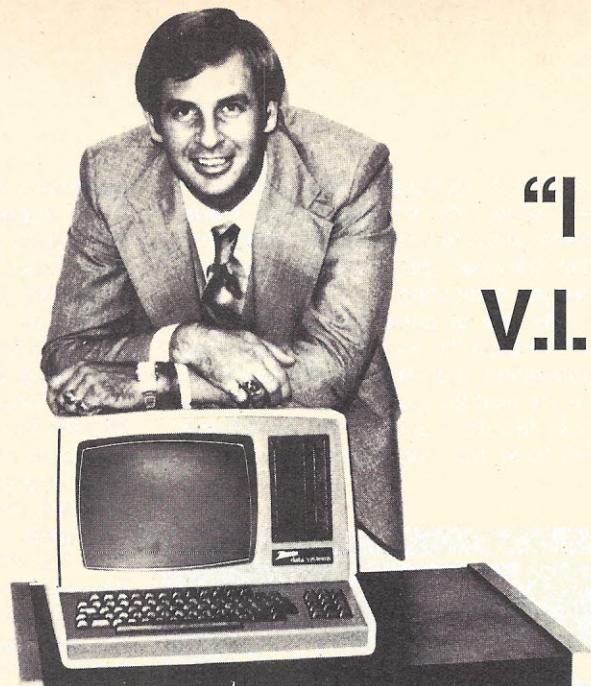
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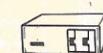
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TS-801 Computer	3295	2650
TS-802 Computerminal	3495	2796
TS-802H Computerm/term	6995	5596
TS-806 Multi User Proc.	7195	5749



NORTHSTAR HORIZON PRODUCTS

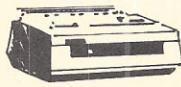
	List	Sell
HRZ 2Q-54K	4495	3149
HRZ 1Q-54K HD5	6695	4999
HRZ 1Q-54K HD18	9270	6749

NorthStar is discontinuing many of their horizon products. Call for availability and price of any product not listed.



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912 Terminal	925	659
920 Terminal	985	725
925 Terminal	985	750
950 Terminal	1195	900



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7710-1 55CPS Serial	CALL	CALL
7720-1 KSR Serial	CALL	CALL
Forms Tractors	CALL	CALL



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	List	Sell
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Mailmanager D/Q	299	235
Infomanager D/Q	499	365
General Ledger D/Q	599	475
AIR D/Q	599	475
APD D/Q	599	475



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	List	Sell
TI-810 BASIC	1645	1398
TI-810 Full ASCII	1745	1479
TI-810 Package	1945	1649
TI-820 R/O BASIC	1995	1625
TI-820 KSR Package	2395	1950



NORTHSTAR ADVANTAGE COMPUTER

	List	Sell
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SIO Board	175	CALL
PIO Board	200	CALL
FPP Board	399	CALL
Graphics Option	299	CALL



MODEMS

	List	Sell
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D-Cat	199	150
Auto-Cat	249	190
Apple-Cat	389	310
DC Hayes Micro-100	379	330
DC Hayes Smart Modem	279	240



EPSON PRINTERS

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MX-80 FT	745	CALL
MX-100	995	CALL
Call for pricing on interfaces and cables		



MORROW DECISION COMPUTER

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Decision 2	CALL	CALL
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Switchboard IO	1000	780
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computer into the home, then so be it. With prices as low as \$150—but generally less than \$800—more and more families can afford a true computer. With the addition of a TV, not only can game playing operate on the system, but even computer concepts can be learned. Commodore offers an introduction to Basic course for the new system while Mattel, so far, is sticking to non-computer related education, such

as French, geography and spelling. In any case, the introduction of these home computer products will bridge the gap between game playing and full-fledged computing.

The use of computers in the home will enhance the awareness of the young generation, just as television has done for the past 20 years. In fact, within the next decade, it is likely that each home will have two computers, one playing

games and one really computing. Initially, it will support some of the mundane tasks such as home budgeting, checkbook balancing and the other common ones. The home computer will become easier to use, more useful, more accepted and, certainly, more affordable.

As long as the manufacturers plan ahead, future expansion can be built into the home computer, so that it can be put to effective use. With the flexibility offered by a keyboard, enhanced software products can easily adapt to the needs of the homeowner and help train the homeowners of tomorrow in the use of a computer system.

Casio has even introduced a computer (\$1,200) specifically directed toward home use—but without the normal game emphasis. We don't mean to imply that these under-\$1,000 systems are to be considered for business applications too—but certainly some will be used that way. We suppose that such a system could be considered as a starter unit to be used until the owner decides to step up to the higher capability system with multiple terminals, floppy disks, hard disks, printers—and higher cost. In the meantime, the users buying the \$500 systems can expect to be operating them for many years. The computer may even replace watching TV trivia—especially if the TV is used as the computer's output device. Would you rather watch *I Love Lucy* or play *Space Invaders*? —TB

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All you have to do is program a GRAFTAX graphic — abstract, landscape, still life, whatever — using an Epson MX-70, MX-80, MX-80 F/T or MX-100 printer. We'll not only put it on our T-shirts, we'll be displaying the winning entries for all to see in June at the National Computer Conference in Houston.

Why, you may ask, are we being so generous? It's simply because GRAFTAX is the most incredible graphics capability made for micros. And we want to see it used to its full potential.

All entries will be judged on originality, creativity and best use of computer equipment. They must be postmarked no later than May 1, 1982, and be accompanied by the software program, so we can recreate the winning entries for verification. Make sure the graphic is no larger than 8" x 10" and no smaller than 4" x 6". And remember, if you digitize art or a photograph, it must have been originally created by you.

So get busy and enter.  
You might be a winner.  
And your software  
could be your "soft-  
wear."



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- 1) Any computer equipment may be used to format the entry, but the graphics output must have been printed on an Epson MX-70, MX-80, MX-80 F/T or MX-100 printer with either built-in or optional GRAFTRAX. Winning entries will be reviewed by Epson for verification.
- 2) Each entry must be accompanied by the software program used to create it. All entries and software and the rights to use them become the property of Epson America, Inc.
- 3) All entries must be at least 6" x 4" and no larger than 8" x 10" in size.
- 4) Art or photographs, if used, must have been created by the entrant.
- 5) All entries will be judged by an independent panel of judges on their creative merit, originality and best use of computer equipment. Decision of the judges is final.
- 6) This contest is valid from January 1, 1982 until May 1, 1982. Entries must be postmarked no later than May 1, 1982.
- 7) Participation in the Epson "Softwear" Sweepstakes is open to any except the following: employees of Epson America, Inc., its service agencies, or their families.
- 8) Winners will be notified by mail no later than June 1, 1982. A list of winners will be made available by sending a stamped, self-addressed envelope to Epson America, Inc., 3415 Kashiba Street, Torrance, CA 90505.
- 9) Entries will be maintained on file at Epson America, Inc. until January 1, 1983.
- 10) Prizes are as follows: First prize includes round-trip economy air transportation for two to Tokyo, from the airport nearest the winner's place of residence, and six nights standard hotel accommodations, double occupancy. Trip does not include airport departure taxes, hotel service charges, cost of transportation or other expenses incurred before leaving the airport of initial departure, returning to Tokyo airport and returning home from the airport of initial departure; nor does it include meals or gratuities. Second prize consists of one Epson MX-100 Printer. Third prize consists of his and hers Seiko Quartz Watches. Additional prizes include 25 Micro-Nine Printheads, 50 Epson Digital Watches, and 100 Epson Ribbon Cartridges.
- 11) You may enter more than once, but each entry must be accompanied by the official entry coupon below.
- 12) Void where prohibited by law.

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Attach this form firmly to the back of each graphic you enter.

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COMPUTER EQUIPMENT USED  
\_\_\_\_\_

PRINTER MODEL AND SERIAL NUMBER  
\_\_\_\_\_

T-SHIRT SIZE    S    M    L    XL

Mail entries to:

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3415 Kashiba Street  
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**EPSON**  
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# LETTERS

## Happy endings

Re: Daniel K. Hollis's letter about his difficulty replacing his Apple II's on-off switch (IA Jan 82), his story is similar to mine, but mine ends more happily. Like Mr. Hollis, I removed the power supply. I then simply pried off the switch with a small screwdriver, a procedure much simpler than removing rivets and a dozen screws. The switch is friction-fitted and not difficult to pop off. Electronics-supply stores stock replacements. After having replaced the switch, I purchased a six-outlet box with its own on-off switch, which enables me to bypass the Apple's switch whenever activating or shutting down my system, adding convenience and longevity to the whole shebang.

Allen H. Kelson  
Chicago, IL

I fully sympathize with the gentleman who complained about the broken power switch on his Apple II computer. I have met this problem several times. We have 16 Apple IIs with 48K and individual disk drives in our microcomputer resource laboratory. These are used by over 250 students per year, eight periods per day, so the number of off-on cycles endured by the machines is phenomenal.

When our power supply switches began to go, replacements were found at the nearest Radio Shack store. A heavy duty toggle switch, catalog number 275-651, fits nicely into the hole and is secured with a large washer. We, too, had to remove twelve screws and two rivets; the rivet heads can be filed off easily as they are aluminum. Be careful to dispose of the filings carefully. The power supply is a marvel of engineering that supplies very pure D.C., but the switch is not adequate for the task.

The motherboard on the Apple is an extremely well built device and has few equals in the microcomputer world. It's too bad that a dumb thing like a switch detracts from an otherwise great machine.

One last note: Why has the disk drive motor been designed to come "on" even if the drive door is open and there is no disk in the slot? I've been trying to figure that one out for years!

John Occhuzzo  
Norwin Microcomputer Center  
N. Huntingdon, PA

## Where credit is due

Re: "Apple-ications" (IA Sep 81), the author mentions Ted Perry as the creator of Block Author Languages (for the Apple). He did not create it at all. It was designed, programmed, envisioned and

written by Linda Slovick. Although Ted Perry often claims credit for it, his only participation was in a portion of the funding. The other person responsible for funding is Jacob Arcanin, Assistant Superintendent at the California School for the Deaf. Linda Slovick works at the California School for the Deaf under government grants. She is a deaf programmer. When Ted Perry goes on T.V. claiming to have written Block Author Language, there is not much that she can do. But she is very proud of her accomplishment and should be given appropriate credit for it.

Beth Slovick  
Concord, CA

## Latest benchmark challenge

Re: "Report Card: Benchmark" (IA Aug 81), I have been able to beat the best time you reported, for the TEI system/48 of 178 seconds. Using a NorthStar and N\*DOS with the floating point board and Allen Ashley's Comstar Compiler to compile the NorthStar Basic program provided in the feature, the run time of the program was 156 seconds. I should also note that I have found this compiler very easy to use and that Allen Ashley has always provided excellent support for all his software. To me that represents at least half the reason for choosing any product—be it software or hardware.

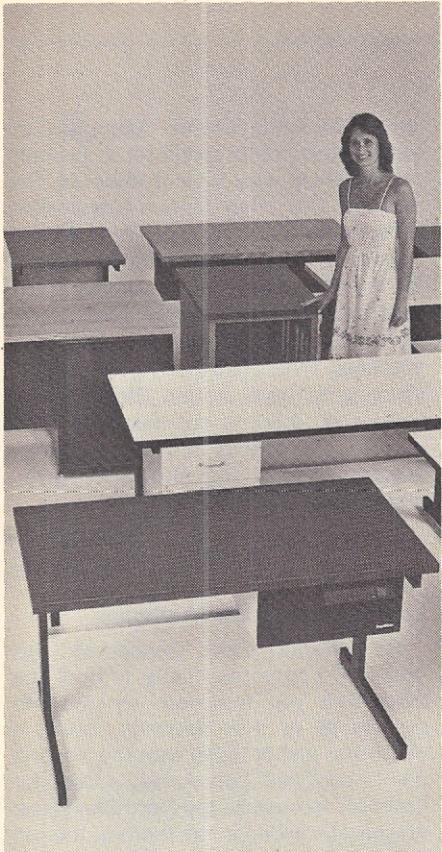
Richard J. McCulloch  
Calgary, Alberta, Canada

## Tracking the TRS-80

Re: "Where Does the TRS-80 Go From Here?" (IA Feb 82), the price of our direct connect modem is \$149, not \$199, as indicated. Your listing of add-on diskette drives for the models I and III did not include our drives for the TRS-80 Color Computer. I agree that the support services through our stores are important, but you seem to have underestimated their strength. There are over 225 Computer Centers, and over 400 stores in which we have expanded computer departments. Beyond that, products and information are available through more than 8,000 Radio Shack locations world-wide.

Martin B. Winston  
Tandy/Radio Shack  
Ft. Worth, TX

Terry Benson failed to mention one storage device and an alternative language in his otherwise good article. The storage device is a tape cartridge. Quantex has one, and Kennedy is coming out with one that interfaces with the TRS model III. The ability to store



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## LETTERS

large amounts of data (up to 13M bytes), removable media (most hard disks are fixed), and use inexpensive media are assets to this type of device. The drawback is the search time, which is minimized with a serpentine type format. They do require a longer access time, which has to be weighed against the advantages in each application. The language is Forth. Miller Microcomputer Services specializes in offering it for the TRS models I and III. While still on the low-end of the learning curve with Forth, I find it has certain definite advantages over the other languages.

When one is trying to solve a problem that requires large data storage and little computer power, it is interesting to note how unbalanced the TRS-80 (and other micros) are. The storage ability lags the rest of the system by far.

J.C. Halbrooks  
Sterling, CT

### More business systems

While your survey of "Business Systems for '82" (IA Jan 82) was excellent, your facts regarding AM Jacquard Systems were inaccurate. Jacquard was founded in the late 1960s and is generally credited with developing the first shared logic, multi function small business computer system—the J100—and bringing it to market. We have never been involved in any work on "mail room equipment and typesetting machines for the printing industry." Your confusion on this point probably stems from the fact that our parent corporation, AM International, has (or had) several divisions producing such products, i.e., AM Varityper, AM Addressograph and AM Multigraphics. We were acquired by AM International in 1978. As part of a major divestiture program, AM put us up for sale about two months ago, along with several other divisions.

David R. Lawson  
Jacquard Systems  
Santa Monica, CA

The comparison tables were superb. I would like to offer a few comments.

Numerous companies have recently unveiled business systems and other products based on the 16-bit "super-chips"; only a few of those were included in the tables. Here are some others:

68000-based: Alpha Micro AM/100/L; Charles River Data Systems' Universe 68; Computhink's Eagle and Hawk; Fortune Systems; Hewlett Packard's 9826; Instrumentation Lab's Pixel 100AP; Q1 Corp.; and Wicat.

8086/8-based: Altos C8600; Artelronics 1000 and 750; Convergent Technol-

ogies IWS and AWS; IBM System/23; Intel's 86/330; Sentinel; Victor Business Systems (Sirus).

78000-based: ADDS' Mentor; Chuo Electronics/COMPAC's CEC8000; Onyx C8002; Plexus P/40; and Zilog's System 8000.

Other 16-bit microprocessor-based: TRW/Fujitsu Affinity 16; TI's DS990 and System 200.

A glaring omission in the table is the Xerox 820. Another is Computhink's Minimax, which placed third in your August issue benchmarks. Of course, the IBM Personal Computer uses an 8088, not 8086 as indicated in the tables.

Omri Serlin  
ITOM International  
Los Altos, CA

### Reader interface

Re: the program "Word Count" (IA Aug 81) by Phil Hughes, I was delighted because it does something very useful in my work on the TRS-80 model III. In his introduction, Mr. Hughes mentioned that it would be very easy to modify it to work with any Basic. Unfortunately, I haven't yet taken a course in Basic. So I asked Radio Shack for help, but they wouldn't do it. I've tried to find friends who can help, but I'm short of the right friends—they don't seem to be able to modify the program. Would one of your readers who has done the necessary modification for the TRS-80 (using Scripsit) be willing to send me the revised program?

Isai Kamen  
11 Sherman Ave.  
White Plains, NY 10605

I am in the process of developing a data base for the software and hardware availability for the IBM Personal Computer system. I plan to publish two monthly listings: one would list the new additions and the other will list all the software and hardware available to that date. The listings would have two parts: one will cover the available hardware and the other will cover the software available in all the areas. The list will be indexed by the title and source. Classification of the product, name, description, configuration required, available form, price, source from where it could be obtained, and other necessary information will be included in the listings. Interested parties developing hardware or software should write as soon as possible to include their products in the list. Persons looking for available hardware and software should also write for information.

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HS186-4	\$825.00	HS187-4	\$25.00	HS187-4	\$						



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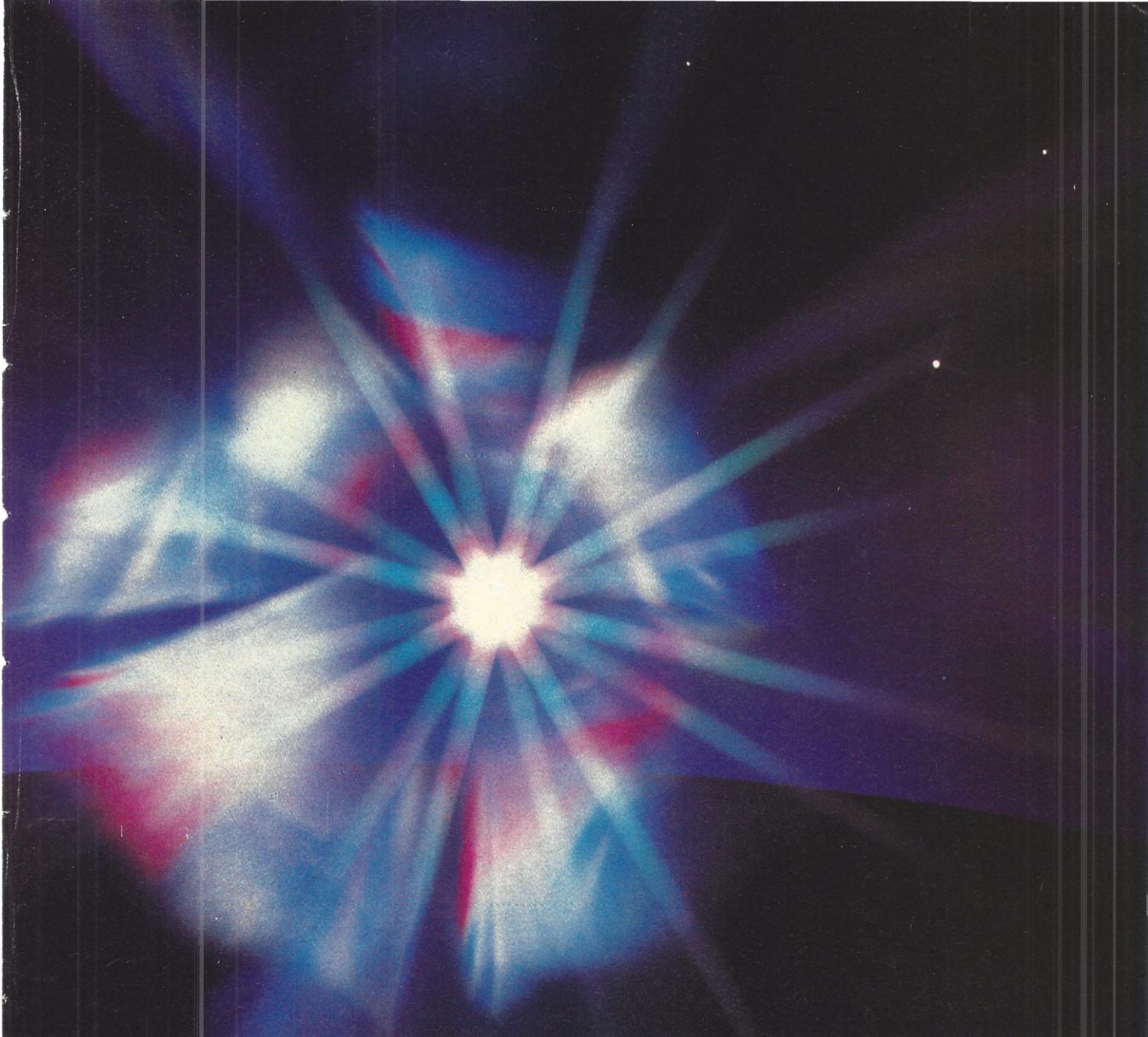
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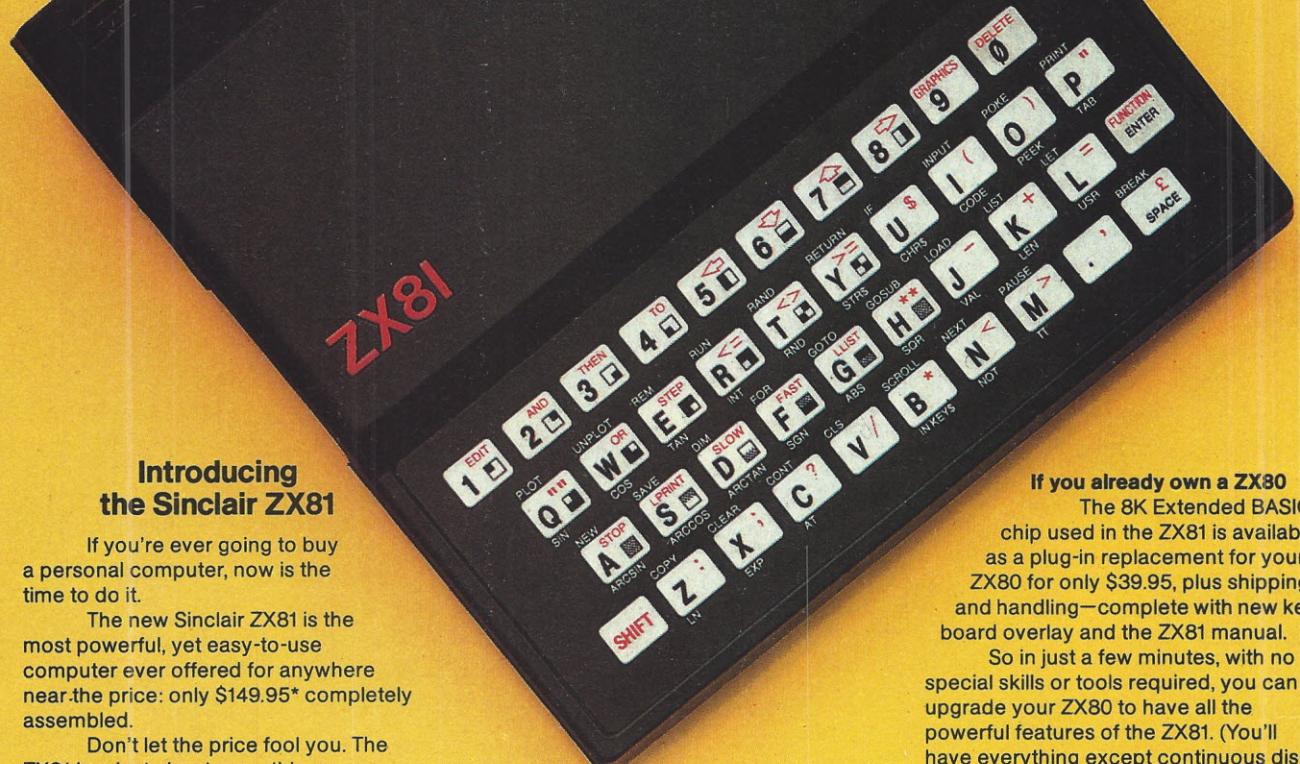


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The Computer Age Home.™*

# The \$149.95 personal computer.



## Introducing the Sinclair ZX81

If you're ever going to buy a personal computer, now is the time to do it.

The new Sinclair ZX81 is the most powerful, yet easy-to-use computer ever offered for anywhere near the price: only \$149.95\* completely assembled.

Don't let the price fool you. The ZX81 has just about everything you could ask for in a personal computer.

### A breakthrough in personal computers

The ZX81 is a major advance over the original Sinclair ZX80—the world's largest selling personal computer and the first for under \$200.

In fact, the ZX81's new 8K Extended BASIC offers features found only on computers costing two or three times as much.

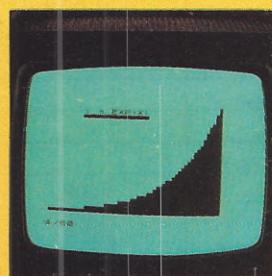
Just look at what you get:

- Continuous display, including moving graphics
- Multi-dimensional string and numerical arrays

\*Plus shipping and handling. Price includes connectors for TV and cassette, AC adaptor, and FREE manual.

- Mathematical and scientific functions accurate to 8 decimal places
- Unique one-touch entry of key words like PRINT, RUN and LIST
- Automatic syntax error detection and easy editing
- Randomize function useful for both games and serious applications
- Built-in interface for ZX Printer
- 1K of memory expandable to 16K

The ZX81 is also very convenient to use. It hooks up to any television set to produce a clear 32-column by 24-line display. And you can use a regular cassette recorder to store and recall programs by name.



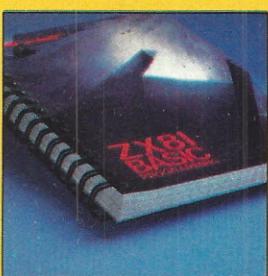
**NEW SOFTWARE:** Sinclair has published pre-recorded programs on cassettes for your ZX81, or ZX80 with 8K BASIC. We're constantly coming out with new programs, so we'll send you our latest software catalog with your computer.



**ZX PRINTER:** The Sinclair ZX Printer will work with your ZX81, or ZX80 with 8K BASIC. It will be available in the near future and will cost less than \$100.



**16K MEMORY MODULE:** Like any powerful, full fledged computer, the ZX81 is expandable. Sinclair's 16K memory module plugs right onto the back of your ZX81 (or ZX80, with or without 8K BASIC). Cost is \$99.95, plus shipping and handling.



**ZX81 MANUAL:** The ZX81 comes with a comprehensive 164-page programming guide and operating manual designed for both beginners and experienced computer users. A \$10.95 value, it's yours free with the ZX81.

### If you already own a ZX80

The 8K Extended BASIC chip used in the ZX81 is available as a plug-in replacement for your ZX80 for only \$39.95, plus shipping and handling—complete with new keyboard overlay and the ZX81 manual.

So in just a few minutes, with no special skills or tools required, you can upgrade your ZX80 to have all the powerful features of the ZX81. (You'll have everything except continuous display, but you can still use the PAUSE and SCROLL commands to get moving graphics.)

With the 8K BASIC chip, your ZX80 will also be equipped to use the ZX Printer and Sinclair software.

### Order at no risk\*\*

We'll give you 10 days to try out the ZX81. If you're not completely satisfied, just return it to Sinclair Research and we'll give you a full refund.

And if you have a problem with your ZX81, send it to Sinclair Research within 90 days and we'll repair or replace it at no charge.

\*\*Does not apply to ZX81 kits.

# The \$99.95 personal computer.

## Introducing the ZX81 kit

If you really want to save money, and you enjoy building electronic kits, you can order the ZX81 in kit form for the incredible price of just \$99.95! It's the same, full-featured computer, only you put it together yourself. We'll send complete, easy-to-follow instructions on how you can assemble your ZX81 in just a few hours. All you have to supply is the soldering iron.

### How to order

Sinclair Research is the world's largest manufacturer of personal computers.

The ZX81 represents the latest technology in microelectronics, and it picks up right where the ZX80 left off. Thousands are selling every week.

We urge you to place your order for the new ZX81 today. The sooner you order, the sooner you can start enjoying your own computer.

To order, simply call our toll free number, and use your MasterCard or VISA.

To order by mail, please use the coupon. And send your check or money order. We regret that we cannot accept purchase orders or C.O.D.'s.

**CALL 800-543-3000.** Ask for operator #509. In Ohio call 800-582-1364. In Canada call 513-729-4300. Ask for operator #509. Phones open 24 hours a day, 7 days a week. Have your MasterCard or VISA ready.

These numbers are for orders only. For information, you must write to Sinclair Research Ltd., 2 Sinclair Plaza, Nashua, NH 03061.

# sinclair



AD CODE	PRICE†	QTY.	AMOUNT
ZX81	\$149.95		
ZX81 Kit	99.95		
8K BASIC chip (for ZX80)	39.95		
16K Memory Module (for ZX81 or ZX80)	99.95		
Shipping and Handling	4.95		\$4.95
		TOTAL	

MAIL TO: Sinclair Research Ltd., One Sinclair Plaza, Nashua, NH 03061.

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

CITY/STATE/ZIP \_\_\_\_\_

+ U.S. Dollars

## Film discusses importance of personal computers

One Pass Productions and CRM/McGraw-Hill have collaborated on a documentary feature on personal computing. *Don't Bother Me, I'm Learning* has completed principal photography. One Pass is producing this documentary feature for television broadcast and



CRM/McGraw-Hill will handle non-broadcast distribution. The explosive growth of personal computers in the community is the focus of the production. Locations include a computer camp for kids, Computer Town U.S.A., a boy's computer club and a laboratory for dolphins.

People of all ages explain and demonstrate how personal computers are

improving the quality of their lives. Viewers see children and adults who are pioneers of this computer revolution. Their everyday uses of computer technology are blueprints for future applications.

According to spokespeople from One Pass, the program will underscore the fact that computer literacy is being recognized as a basic lifeskill for the 80s, because of the increasing frequency of people/computer interface in everyday life.

## Employer requests for data processors up sharply during 1981

Employer requests for computer personnel during 1981 were up 23% over 1980, reports Robert Half International, a data processing recruiter.

The organization attributed the sharp rise in demand for data processors to three major factors. In this period of severe inflation, high-interest rates and growing competitive pressures, businesses must generate, retrieve and analyze more information more quickly than ever before. Secondly, the new inexpensive mini- and microcomputers

are enabling smaller firms to realize the benefits of on-premises data processing facilities for the first time. Finally, additional data processors are needed to maintain and upgrade existing systems, to operate new, more sophisticated hardware.

Robert Half, head of the company, said that he expected nationwide demand for computer professionals to remain "exceptionally strong" in the foreseeable future.

## News teletext magazine off and running in Chicago

Nite-Owl, a news and information teletext magazine, recently premiered on a local Chicago, IL, television channel. The program is broadcast seven nights a week, midnight to 6:00 a.m.—providing the only continually updated television news package in the Chicago area in this time slot.

Viewers see rolling pages of text and computer-produced graphics of the latest international, national and local news, sports, weather, travel, entertainment, and financial information, plus advertising messages.

## Compare our price and performance. *Le Monitor* is second to none!



A complete line of monitors with these outstanding features.

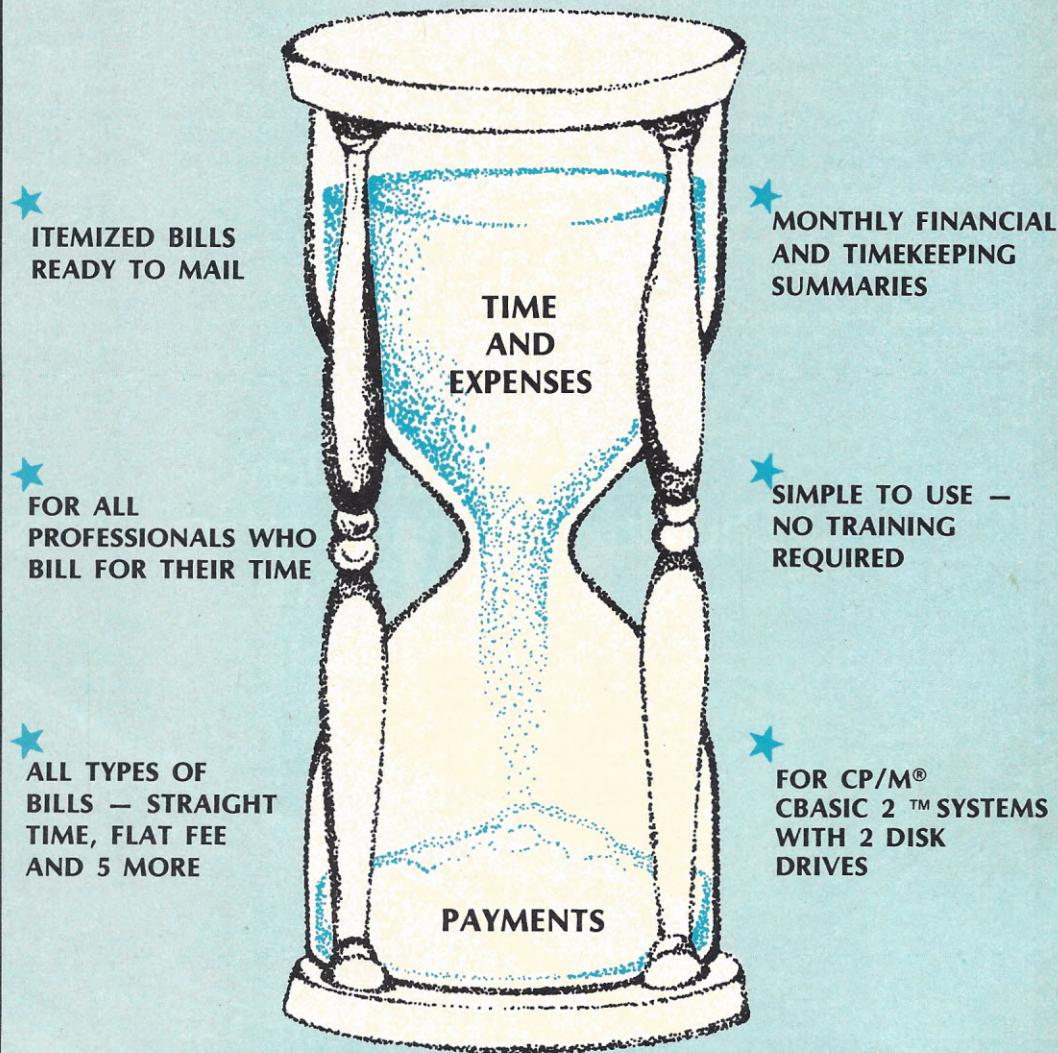
- 9" and 12" models
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At Hayes, we don't believe in second best. Or planned obsolescence. We believe in taking the state of the art to the limit. Our new Smartmodem, for example, is the most sophisticated 300-baud originate/answer modem you can buy. And yet, it is perhaps the easiest-to-use modem ever.

**RS-232C Compatible.** Smartmodem lets any RS-232C compatible computer or terminal communicate by phone with other computers and time-sharing systems located *anywhere in North America*. You get full and half-duplex operation with both Touch-Tone® and pulse dialing.

**Auto-Answer/Dial/Repeat.**

Smartmodem can answer the phone, dial a number, receive and transmit data, and then hang up the phone—automatically! If desired, Smartmodem will even repeat the last command. You can depend on Smartmodem for completely unattended operation.

**Completely Programmable.**

Smartmodem can be controlled using

# Hayes Stack™

Microcomputer Component Systems

any programming language. Over 30 different commands can be written into your programs or entered directly from your keyboard.

Smartmodem also includes several switch-selectable features that let you tailor performance to your exact needs. You can "set it and forget it" for the ultimate in convenience.

**Built-in Audio Monitor.** Thanks to an internal speaker, you can actually listen to your connection being made. You'll know immediately if the line is busy or if you reached a wrong number—

and you don't even need a phone!

**Status at a Glance.** Seven LED's indicate Smartmodem's current operating mode: auto-answer, carrier detect, off hook, receive data, send data, terminal ready and modem ready. You're never left in the dark!

**Direct-Connect Design.**

Smartmodem is FCC registered for direct connection to any modular phone jack—there's no acoustic coupler to cause signal loss and distortion.

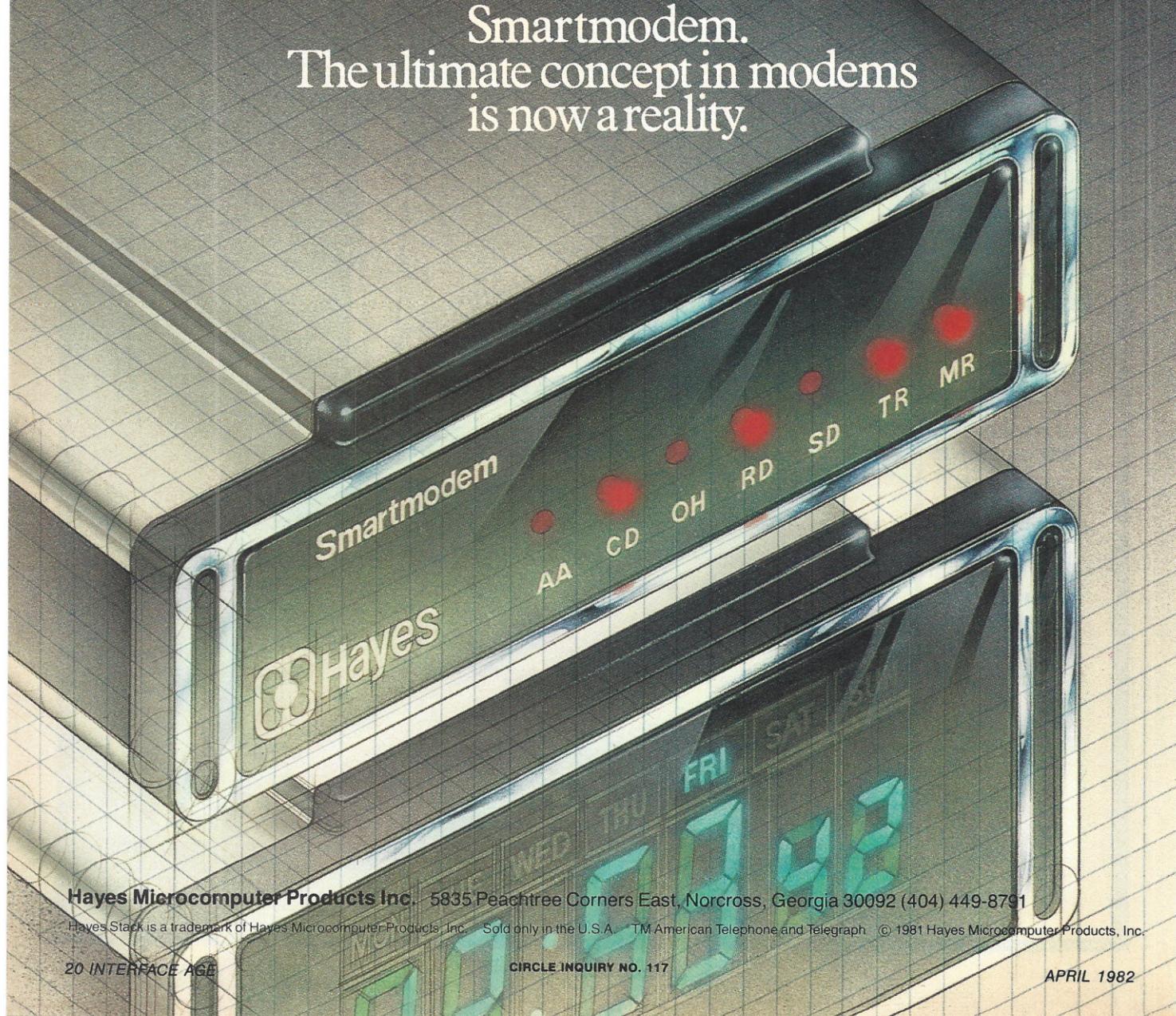
**Smartmodem, Smart Buy.** Professional quality features. Versatile performance. A full two-year limited warranty. A suggested retail price of only \$279.

What more could you want? Perhaps the matching Hayes Stack Chronograph, an RS-232C compatible calendar/clock system.

Check out the Smartmodem wherever fine computer products are sold. And don't settle for anything less than Hayes.



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The 20-minute news orbits are updated throughout the night by specially trained teletext journalists who utilize Nite-Owl's flexibility and speed to include new information on developing stories and report late-breaking news.

The show is produced by Field Electronic Publishing of Chicago. Since last April, FEP has been broadcasting Keyfax, a demand teletext system that allows users to select information through a hand-held keypad. Keyfax is carried on an unused portion of the Channel 32 signal to decoder-equipped television sets in Chicago area high-traffic public places and private homes.

Keyfax was the first commercial teletext experiment approved by the Federal Communications Commission.

The data base for Keyfax and Nite-Owl includes information supplied by the Associated Press, United Press International, Dow Jones, the Chicago City News Bureau, the Chicago Sun-Times and the Chicago Public Library.

### Bookstores take aggressive approach in specialty retailing with POS

The Waldenbooks nationwide bookstore chain recently completed installing point-of-sale (POS) terminals in its more than 700 retail stores.

The complexity of the move to computerized selling is underscored by the fact that the average Waldenbooks store offers more than 20,000 different books (with frequently triple that number of volumes in stock) in approximately 3,200 square feet of selling space. The company prepared its own software packages to handle its very specific requirements, basing the system on the IBM 3680 programmable POS system.

The resulting installation is one in which individual stores now "talk" automatically each night with the company's IBM 3033 computer in Anaheim, CA, giving sales figures, titles sold, merchandise orders and other data. The information is transmitted to Waldenbooks' Stamford, CT, headquarters, where it is compiled into reports that are sent to each store weekly.

These reports help store managers maintain stock levels of both new releases and steady-selling or backlist books, expand high interest sections and evaluate various display and merchandising techniques. Managers are thus able to do their jobs more effectively with less time-consuming routine work.

When Harry Hoffman became president of the Waldenbooks division of Carter Hawley Hale Stores in 1979, the company's POS capabilities encompassed only 70 stores. The remaining

500 had mechanical cash registers without information collection capabilities.

"I felt very strongly that to build both profit and service levels, we needed more up-to-date information on what was selling, what was in stock and what should be reordered. Only a full-scale, computer-based system could give us the tools required to make sound marketing decisions," Hoffman said.

By emphasizing the data processing requirements of Waldenbooks, Hoffman, in effect, defined a goal for the management information systems department to develop a completely new system that would handle current business requirements, yet could be adaptable to more complex functions in the future.

### Learning center on electronic products opens in Chicago

A learning center to provide information and education on the use of electronic products in home and business recently opened in Chicago, IL. Targeted at the business and professional community as well as the home market, the center will help end users understand, select and apply the wide range of computing products now available to help solve business problems, increase productivity and bring computing power into the home.

The Chicago Learning Center is a response by Texas Instruments, Dallas, TX, to the difficult problem of marketing today's increasingly affordable, yet complex electronic products to the people who can benefit from them.

The center will offer a broad range of seminars, lectures, workshops, demonstrations, and videotape courses on TI electronic products and applications. In order to meet the needs of as many people as possible, these activities will take place not only at the center itself, but also in a network of schools, corporations, and other institutions and facilities in the greater Chicago area. Some of the educational services will be free; others will carry a nominal tuition.

In addition to providing educational services, the center will offer a variety of books, manuals, literature and software, as well as accessories for electronic products, such as batteries, power packs, thermal paper and cables.

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### Fog Index Revisited

Following are two programs about the fog index, supplied by our readers. In case you missed the earlier columns, the fog index is a method of calculating the difficulty of written material. It is based on a formula involving the number of difficult words, and the length of sentences in a text.

If:

A = average length of sentences  
B = percentage of words over 3 syllables

Then:

$$\text{Fog Index} = .4 * A * B$$

Leo Jankowski, from New Zealand, sent the following letter about the problem of finding three-syllable words. His programs are shown in listings 1-3.

There are several ways of looking in a text for words that have three or more syllables. Unfortunately, no single method can be successful, since so many English words break rules followed by other groups of words. Four counting methods suggest themselves.

The first methods (listing 1) checks for words of eight or more letters long. It wrongly counts words such as something, somewhere and words ending in ed (such as controlled). Words like area, unity, iota, paragon and Iowa are not counted. In fact, these four-letter words would need a separate, elaborate routine of their own, no matter what method we use.

With listing 2 (another method), count the vowels (including y) to count a syllable. If two vowels come together, count once only. Count if 'y' ends a word. This method fails on those four-letter words and also on: isle, aisle and yclept! Then there's edible, principle, washable, terrible and horrible!

This is where the next two methods come to the rescue. Count consonants, which are indexed by the vowels in the word. Listing 3 counts if a vowel is followed by a consonant. Another method is to count if a vowel is preceded by a consonant. Also, count if a vowel (including y) begins or ends a word. Vowels immediately following another vowel are ignored. So words like terrible and horrible are picked up (even yclept!), but the problem of those four-letter words still remains.

No doubt a program could be written to take care of every exception. Unfortunately, it would take an inordinate length of time to run, compared to the program in listing 1.

Another reader from Chicago, IL, Judy Castle, sent in a fog index program that allows you to analyze ASCII text files

already recorded on diskettes. The program asks for the name of the file, opens the file and reads the text in one line at a time. As the program analyzes the text, it also prints it on the screen (line 110), and flashes a graphic character (line 120) over each letter.

### Hurling brickbats

Breakout is a game for the TRS-80 Color Computer sent in by Paul Ruby of Rochester, PA. The object is to break through a wall of colored bricks by bouncing a ball off the wall. Like Pong, the player keeps a ball in play by hitting it with a paddle that can move horizontally across the bottom of the screen. If the player misses a ball, he starts over with a new one. The game ends after a set of four balls.

The wall is drawn by the FOR loop starting at line 30. The color of the bricks in the wall is set by a random number between 3 and 8 in line 50. Line 60 initializes the position of the ball near the center of the screen. The flag Q is used to indicate whether the ball will move to the left or right, and flag W indicates whether the ball is moving up or down.

In line 110, the joy stick is read and its value is stored in the variable D, which is used to indicate the horizontal position of the paddle. Lines 120 and 130 ensure that the paddle cannot move off the screen. The paddle, which is five graphics blocks wide, is drawn by lines 140 through 160.

Lines 170-200 check the position of the ball and change the direction flags Q and W to make the ball bounce off the edge of the screen. The new position of the ball is worked out by lines 220-260. If the horizontal position flag, Q, is equal to 0, the value of X will be increased by 1 or 2, depending on the RANDOM number in line 230. If the vertical motion flag, W, is also equal to 0, the value of Y will be increased by exactly 2 (line 250). The net effect of increasing both X and Y makes the ball move toward the lower right hand side of the screen.

The POINT command of line 290 examines the color of the position immediately below the ball to determine if the ball has hit the paddle. Lines 350 to 390 are executed only if the ball is missed. The number of balls used, A, is incremented in 360 and a "missed ball sound" is generated in lines 370 and 380. The POINT command of line 330 checks to see if the ball has hit the wall. If so, the routine at line 500 increases the score and changes the direction of the ball. Note the equation in line 510; it is useful for alternating the value of a flag between 1 and 0.

### Allowing neither steering nor English

This game allows for neither steering the ball nor putting "English" on it. Once the ball bounces off the paddle, it moves up and to the right or left at a random angle. To allow the paddle to "steer" the ball as it moves up, you can add:

125 IF W = 1 THEN X = D

A more complicated method of controlling the motion of the ball could be accomplished by checking where the ball hits the paddle and letting that determine the angle of rebound. If X equals D when the ball hits the paddle, it has to hit in the middle. If the absolute value of X - D = 2, then the ball hit on the edge of the paddle. In the current version of the game, the angle that the ball moves is determined by the random number added to or subtracted from X in lines 220 and 230. If these random numbers were replaced by a variable determined by where the ball hit the paddle, a different type of "steerability" could be added to the game.

According to Ruby, it is possible to increase the speed of the game on some color computers by POKEing 65495,1. This appears to increase the clock speed. To return to normal speed, POKE 65494,1. □

***Listing on page 148***

APRIL 1982

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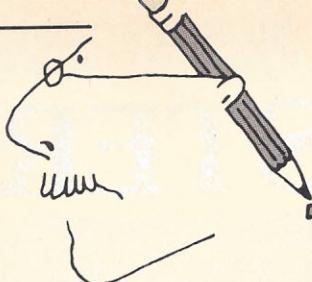
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# THE INVENTOR'S SKETCHPAD

by Roger C. Garrett

## Flat Panel Display with Depth

In last month's column, I described an approach to generating relatively static displays using a magnetic liquid technology. This month's column will demonstrate how a color display might be made, based on my approach.

One common approach to color displays using liquid crystal technology is to bind a dye molecule to each crystal (figure 1). When all of the crystals are aligned (either by passing a current through them as with most LCDs, or by bringing a magnetic field nearby as with the technique described last month), the ambient room light passes freely through the crystal layer and is absorbed by a black layer on the back surface of the display. But when the crystals are randomly oriented, the ambient light does not pass through. Instead, it impinges upon the dye molecules, which absorb only certain wavelengths of light and reflect the rest. This results in

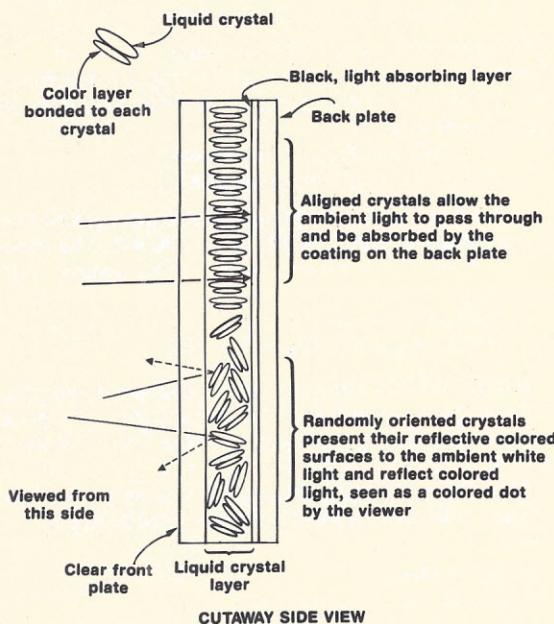


Figure 1. Binding a dye molecule

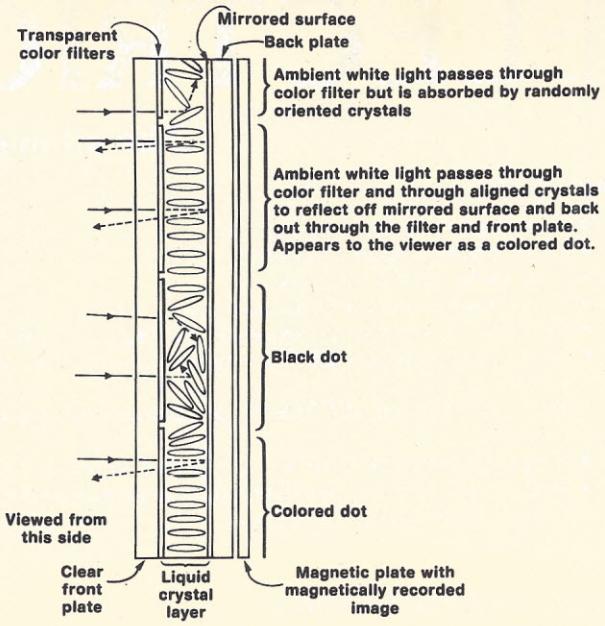


Figure 2. Use of electrically alignable crystals

colored light being reflected and a colored spot being visible to the viewer.

Such an approach is fine if we want a display that is all of the same color, since we can fairly easily distribute the dye-bonded liquid crystals throughout the liquid crystal chambers of the display, just as we would for a normal, un-colored LCD. But trying to produce a multi-colored display is quite a bit more difficult, if not utterly impossible. The manufacturer would have to place individual droplets of variously colored liquid crystals into thousands (or perhaps hundreds of thousands) of separate chambers. In the case of my magnetically aligned crystal approach in which all of the liquid resides in one large flat chamber, keeping the individual droplets separated is simply out of the question.

So we take a more simplified approach. We forget about trying to bond colored dyes to the liquid crystals and use our standard everyday transmissive type crystals. These are the kind that allow light to pass when aligned but absorb the light when randomly oriented. Figure 2 shows an approach using magnetically alignable crystals, but the technique works just as well with electrically alignable crystals.

We place a set of transparent colored filters into our display device. We will have three different colors—red, green, and blue, and there will be a separate filter for each dot (or pixel) of our display. Assuming our display is 512 lines by 512 dots per line, we will have  $512 \times 512 = 262,144$  pixels, each one having a red, green or blue filter dot in front of it. Now as the ambient light passes through a filter dot, it becomes colored according to the color of the filter. It then passes through the liquid crystal layer behind it (assuming that the crystals for that pixel are aligned), bounces off of the mirrored surface of the back plate, and back out to be seen

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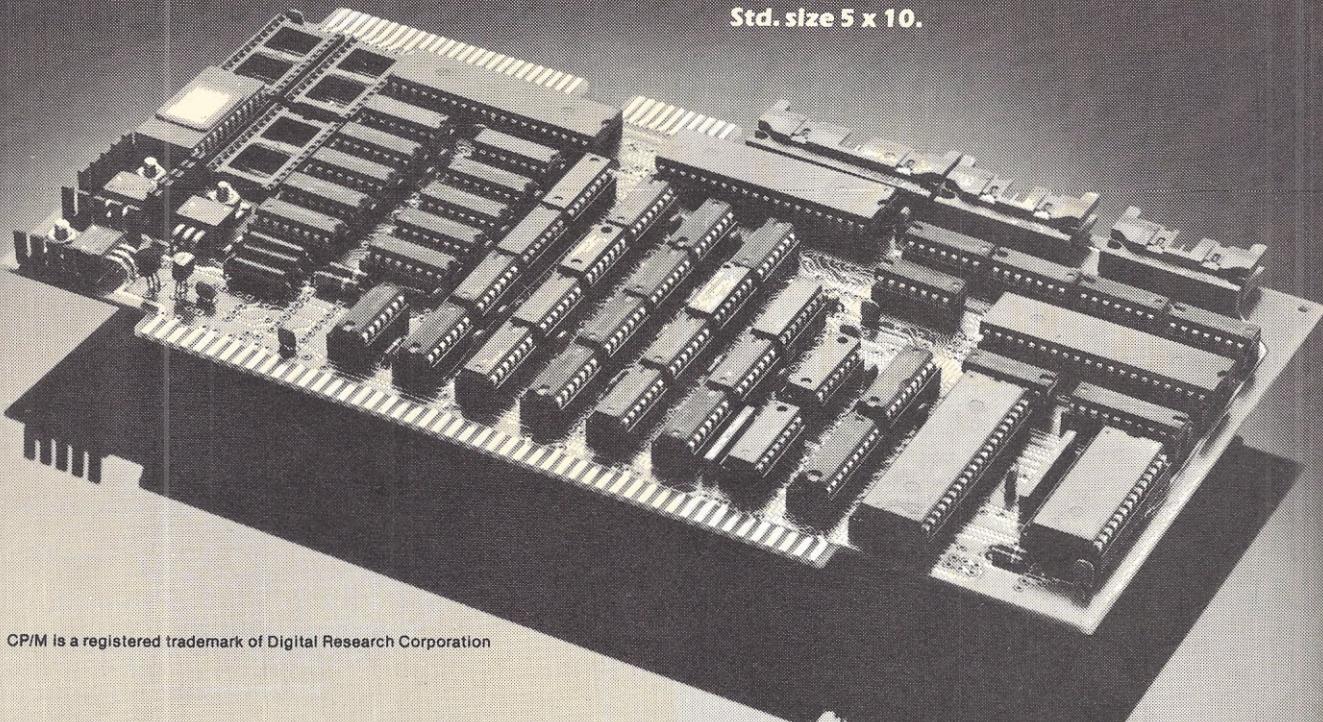
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by the viewer as a visible colored spot. For those pixels whose crystals are randomly oriented, the viewer will see only a black spot, since the light, although colored by the filter, will be absorbed by the crystal layer. By appropriately controlling

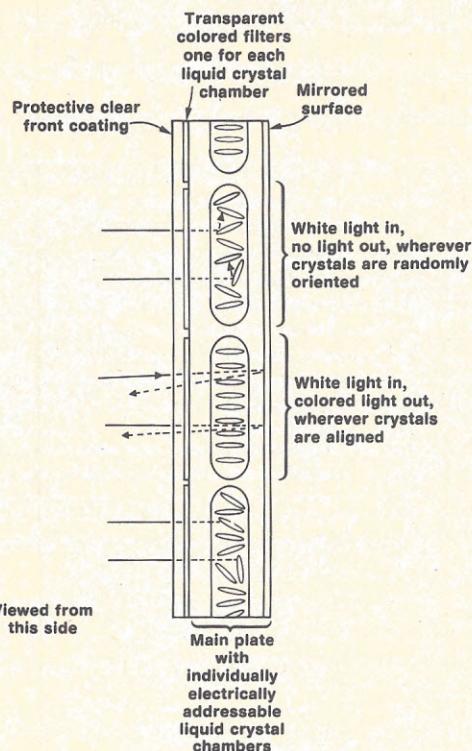


Figure 3. Use of electrically controllable crystals

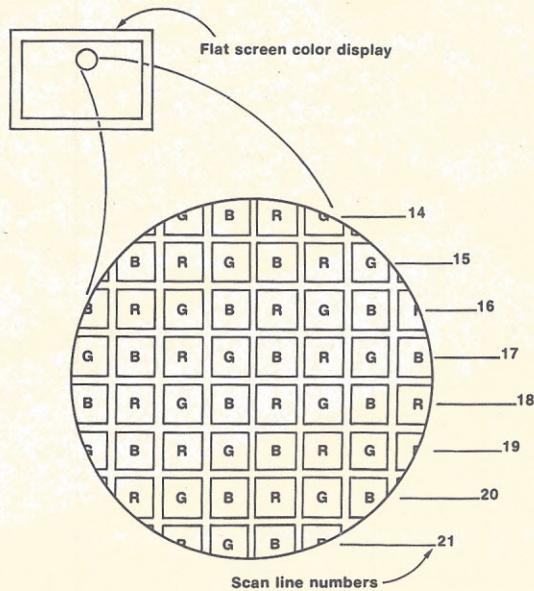


Figure 4. Front view of display

which pixels are "on" (crystals aligned) and which are "off" (crystals non-aligned), we can generate color displays.

Since it would be nice to be able to generate fairly interactive displays (i.e. ones that can be updated relatively quickly), we will want to build our display using electrically controllable crystals, rather than magnetically controllable ones. Figure 3 shows just a display. In this case, the liquid crystals reside in

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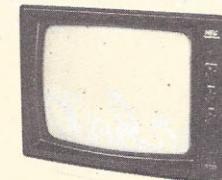
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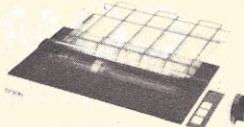
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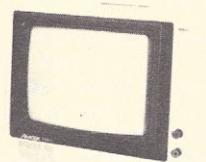
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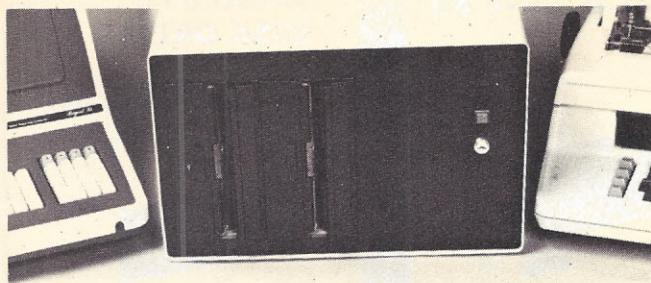
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28 INTERFACE AGE

individually (and electrically) addressable chambers, rather than in one massive chamber as depicted in the previous figure. It should be easier to see how each color filter corresponds to a single pixel of the display.

Looking at figure 4, we can see what the display would look like from the front. It is divided up into a rectangular array of dots. Each dot is made up of a color filter, here denoted by a letter (r = red, g = green, b = blue), and a liquid crystal chamber. Although I previously described these as pixels, it is more precise to define a set of three dots—one red, one green, one blue—as constituting a single pixel. Each horizontal "scan line" is comprised of a set of these pixels. The figure shows one possible way of arranging the dots into pixels. There are a variety of ways to group them as demonstrated by the several schemes employed by manufacturers of television sets. For our purposes here, however, let's assume we are using this simplified approach.

### Scan lines categorized

Each "scan line" of the display is logically numbered, as shown. What is most important here, however, is that we can divide the scan lines into two groups—the odd and even numbered ones. This will come in handy, since we are going to make our display more than just a colored display; we are going to make it a three-dimensional display.

In figure 5, we have made our basic display a bit more complex. We still have an array of individually electrically addressable liquid crystal chambers, which we can (under

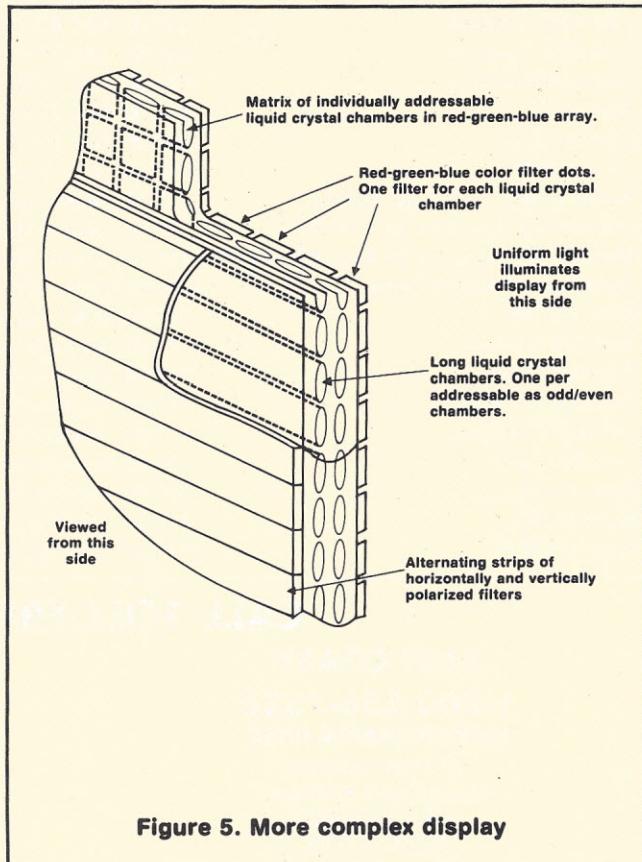


Figure 5. More complex display

computer control) turn on and off to generate our color displays. But we have added a set of long liquid crystal chambers, one such chamber for each scan line. In front of each long chamber, we have placed a polarized filter. For the odd numbered scan lines, these filters are vertically polarized; for the even numbered scan lines, they are horizontally polarized. All of the odd numbered long chambers are electrically connected, such that activating one activates all. Likewise for the even numbered ones.

With such a setup, we can now control which set of scan lines is visible at any given point in time, the even numbered

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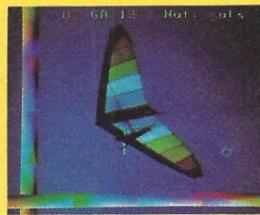
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ones (figure 6) or the odd numbered ones. When we activate odd numbered ones, light freely passes through only the odd-numbered long chambers. It is blocked from passing through the even-numbered chambers. The light that does get through then passes through the color filters and image cham-

**We do not see  
exactly the same thing  
with our left eye  
as we do  
with our right eye.**

bers of the odd scan lines. Anyone viewing the display would see only that portion of the image that resides in the odd numbered scan lines. When we reverse the situation, turning off the odd numbered lines and turning on the even numbered lines, the viewer can see only the even numbered scan lines.

Why, you ask, would we want to do such a thing? Look at figure 7 and it should all become clear. Human beings, having binocular vision, perceive depth (3D) when the brain interpolates between the two separate images seen by our eyes. We

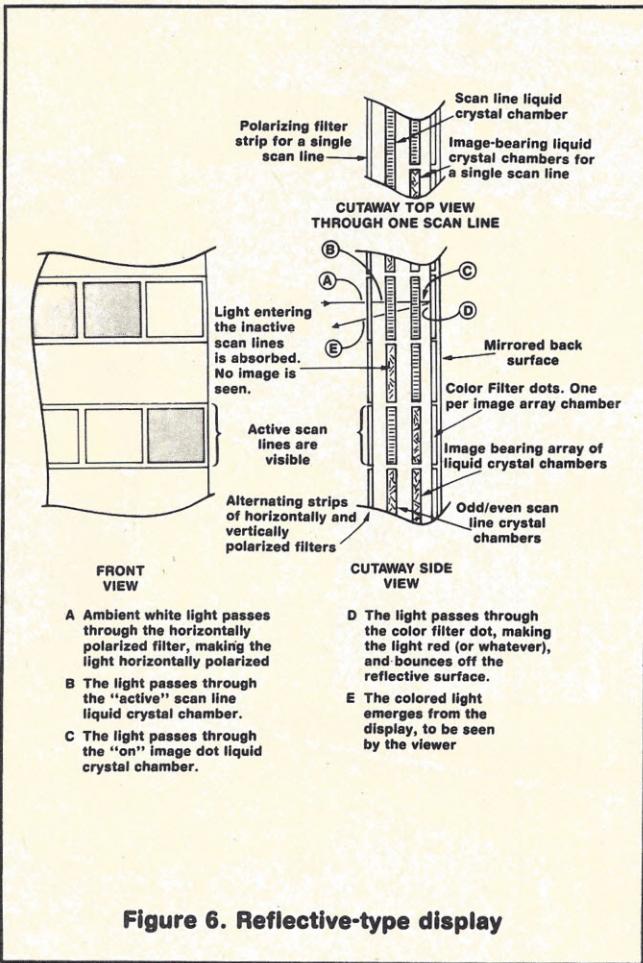


Figure 6. Reflective-type display

do not see exactly the same thing with our left eye as we do with our right eye. If we can present each eye with a view corresponding to what it would see if it were viewing a real three-dimensional scene, even if the images were artificially produced as with a computer, the person would perceive a three-dimensional image. The problem is in presenting a separate image to each eye when all we have is one display device. The solution is to alternate between two images, a left eye

# Vista vision 80

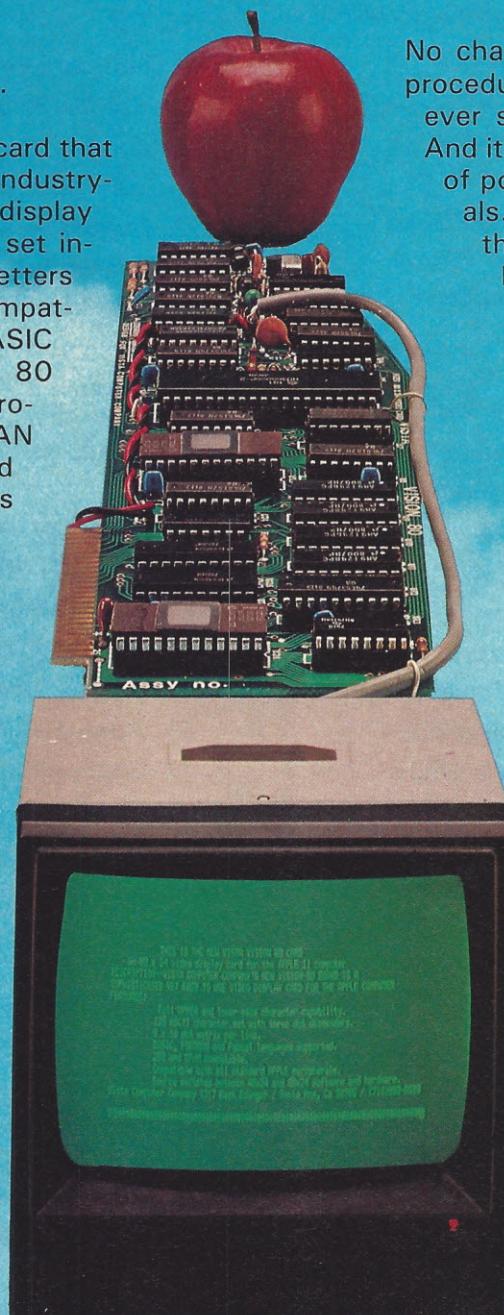
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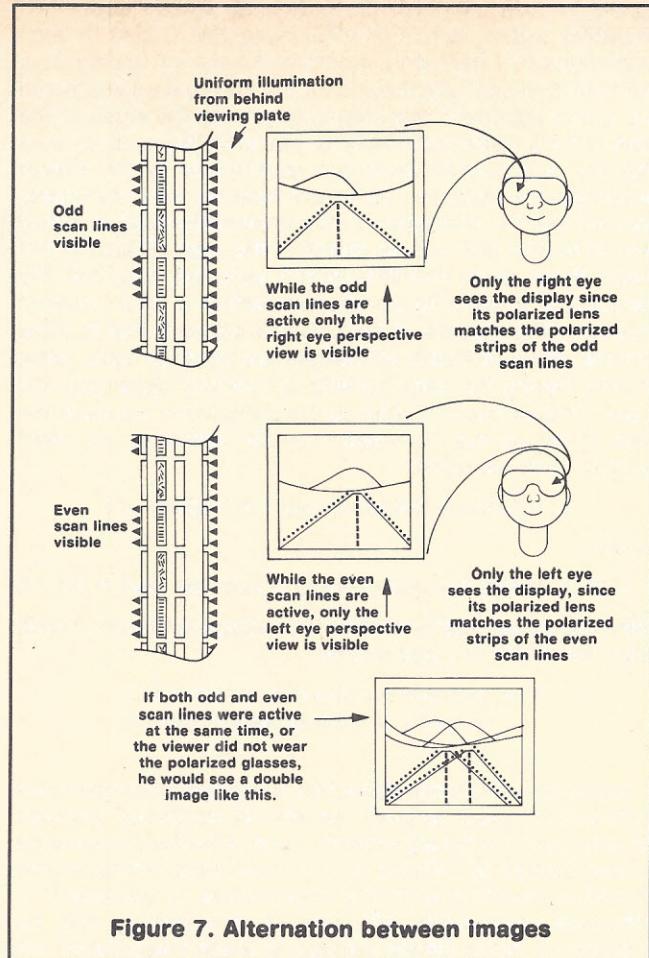
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**Figure 7. Alteration between images**

perspective image and a right eye perspective image, and to cause each eye of the viewer to see only that image meant for that eye.

With the flat screen display described here, we can do just that. We program our computer to generate left eye views (of whatever images we are trying to present) only for the even scan lines of our display, and to generate right eye views (of the same image) only for the odd scan lines. An independent clocking mechanism (independent of the image generation, that is), which alternately turns on and off the odd and even

scan lines, so that the viewable image alternates between left and right eye views. This alternation will have to occur at least 30 Hz in order to avoid visible flicker.

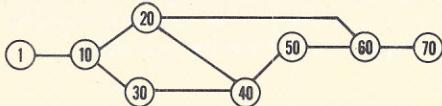
Now, if we were to look at this display, we would see the view shown in the bottom of figure 7, i.e. a composite of both views, since our eyes (fortunately) exhibit "persistence." This means that the two images, although not overlapping in time, seem to overlap in space. While we want to make use of this persistence, we do not want both eyes seeing both images, so we place a set of polarized eyeglasses on our viewer. These glasses are not the ordinary kind you find in drugstores. Rather, they have the left lens vertically polarized and the right lens horizontally polarized. Only light that matches the polarization of the lens will pass through that lens.

This means that the image on the display for the left eye, which is vertically polarized by the filter on the even scan lines, will only be seen through the left eye vertically polarized lens. It will not be seen by the right eye, since the horizontally polarized lens of the right eye will not pass vertically polarized light. And similarly for the right eye, passing only the displayed image for the right eye. Since each eye experiences persistence, it will continue "seeing" the image for the short time, while the other image is being displayed. So the viewer does not perceive any flicker and the brain interpolates the two images into one complete three-dimensional image.

Now, using polarized filters to separate images is a technique that has been used for years. It has not been very successfully applied to computer or television displays because of the problems of aligning the CRT scan lines with their polarizing filters. This is due to the relative difficulty of assuring that a given scan line, generated by an electron beam and controlled by electrostatic or electromagnetic fields, repeatedly scans the exact same position on the screen. But with the advent of flat screen displays in which each pixel is precisely positioned, we no longer have the problems associated with CRTs. As I have shown here, we can now generate stereoscopically three-dimensional displays quite easily. And of course, we are not limited to computer-generated displays. We can use a set of stereo video cameras in which one supplies the odd scan lines and the other supplies the even ones.

Although we have yet to see commercially available flat screen displays using liquid crystal technology, there are several companies hard at work on the problems. Some have even demonstrated proof-of-concept prototypes. It should not be long before they are a commercial reality. After that, three-dimensional displays will not be far behind. □

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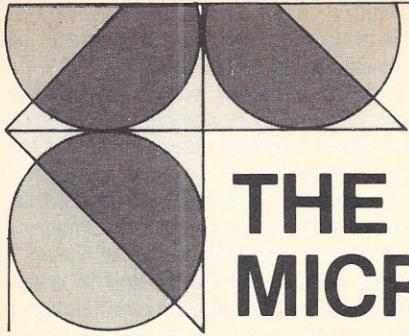
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by Dr. John C. Nash

## Forecasting—a tool for business

Minding the store is only a part of running a business. Frequently, the success of a venture is decided in the quality of the planning that precedes all the investment, work and worry. In such planning, the ability to look ahead and forecast the conditions and behavior of the markets in which the venture will operate lends a great advantage to the entrepreneur. In this month's column, we examine some aspects of forecasting. While this brief view is only superficial, the principles apply more generally to most modern forecasting methods.

Most forecasting methods rely on a conceptual model of the system to be previewed. This model may be a very crude picture in the mind of the entrepreneur of how the world behaves. For example, it may be as simple as a belief that a newspaper advertisement will increase sales between 10% and 20%. Alternatively, a large amount of practical business experience may be distilled into an equation for the same situation such as

$$(\% \text{ increase in sales}) = 0.0015 \times (\$ \text{ spent on advertisements})$$

For forecasting purposes, the latter of these two models is more precise in that the prediction it makes gives a specific figure for future sales. It may also be more accurate if it is reliably close to the actual outcome of spending on advertisements. We may, from past experience, even be able to refine the model by adding some statement about possible variation of the actual outcome from the prediction, e.g.  $(\% \text{ increase in sales}) = 0.0015 \times (\$ \text{ spent on ads}) \pm 3\%$ . Further refinements to the model would likely try to "explain" part or all of the variation that remains between the model and actual outcome.

For quantitative modeling, the models that are most useful have a mathematical formulation. This is not to denigrate many of the qualitative, technological or subjective assessment techniques for forecasting (particularly for predicting long-term changes) that have been developed and used frequently with highly satisfactory results. Here we will focus on the quantitative methods most appropriate for short to medium term previews. Furthermore, while large system models may simultaneously predict many properties or variables of interest, as in some of the large econometric models used in government and industry, we will restrict our attention to just one variable. Let us call this variable  $X_t$ , the value of the quantity of interest at time point  $t$ .

Here we have indirectly introduced the concept of time, which is implicit in all forecasting. The observed values of  $X$  form a time series, a sequence of observations for the variable, one for each time point. In almost all time series, the periods are considered equally spaced, so that numbering the observations sequentially

$$X_1, X_2, X_3, \dots$$

is sufficient to give their time distribution. The wording "considered equally spaced" is important, for it is usual to

ignore, for example, Saturdays, Sundays and holidays when analyzing stocks, bonds or other securities traded through exchanges that have only a certain number of trading days per month. In fact, adjustments for the trading days in a month are a very important first step in beginning the study of the market for a given commodity or security. We must be sure that the adjustments made are appropriate to the market practices and traditions. As an example, we may reasonably assume that the consumption of a commodity such as animal feed is regular over a given month of the year. (This does not mean there is no month-to-month variation; just that the variation is unlikely to be irregular within a given month.) However, the vagaries of the calendar are such that in some months, the commodity exchanges are open 23 days, while months having the same number of calendar days may only have 19 open days. In order to standardize the values in the time series so that the values can be compared, we might want to form the series

$$X_t = (\text{amount traded on day } t \text{ of trading}) \times F$$

where

$$F = (\# \text{ of trading days in month}) / (\# \text{ of calendar days in month})$$

Alternatively, we might compute the average number of trading days per month in a year and let

$$F = (\text{average } \# \text{ of trading days/month}) / (\text{actual } \# \text{ of trading days in month})$$

Naturally, with commodities that are traded but not actually "consumed," such as gold, currency or securities, we must be very careful in the adjustments made. A further complication is that caused by missing or corrupted data, where we are forced to impute one of the observations  $X_t$  because it is otherwise unavailable. All sorts of mechanisms may be considered, but a simple average or linear interpolation will usually be adequate:

$$X_t = 0.5 \times (X_{t-1} + X_{t+1})$$

From now on, let us assume that the series  $X_t, t = 1, 2, \dots, T$  is recorded correctly and completely, and has been adjusted for any effects that may mislead our analyses. It is now our job to find mathematical models that fit or "explain" the patterns in the data. We will consider two very simple, yet quite effective models for doing this: smoothing and decomposition.

The smoothing model assumes that the actual data is making random excursions from some steady or smooth variation. The simplest model assumes that there are random fluctuations about a single fixed value. We can therefore compute the average or mean of the series and use it for a forecast of future values of the series. Of course, few time series are stationary, that is, have no long term trend. We could improve our forecast—the mean—by updating it with new information (new data points) as they become available. Thus if we start with  $n$  points and have the average

$$M(n,n) = \left( \sum_{j=1}^n X_j \right) / n$$

as a forecast for  $X_{n+1}$ , it is obvious that once  $X_{n+1}$  is observed, it should be added into the average

$$M(n+1,n+1) = (n * M(n,n) + X_{n+1}) / (n + 1)$$

If the series actually has a trend, we may wish to drop some points from the average and use only the latest  $k$  points (e.g.  $k = 5$ )

$$M(k,n) = \left( \sum_{j=0}^{k-1} X_{n-j} \right) / k$$

The update when  $X_{n+1}$  is available is then

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$$M(k,n+1) = (k * M(k,n) + X_{n+1} - X_{n+1-k}) / k \quad (1)$$

$$= M(k,n) + (X_{n+1} - X_{n+1-k}) / k$$

$M(k,n)$  gives the moving average of the  $k$  most recent values at point  $n$ . It is used as a forecast for  $X_{n+1}$ , so let us call it  $F_n(1)$ , the forecast made at point  $n$  for one time period ahead. Likewise,  $F_n(3)$  is the forecast made at point  $n$  for three periods ahead, that is, a forecast for  $X_{n+3}$ . Equation (1) can now be considered as a forecast updating formula:

$$F_{n+1}(1) = F_n(1) + (X_{n+1} - X_{n+1-k}) / k \quad (2)$$

This requires us to "remember" at least  $k$  data values. An alternative viewpoint to moving averages is to regard this formula (2) as but one member of the class

$$F_{n+1}(1) = F_n(1) + (\text{correction}) \quad (3)$$

An obvious correction is

$$\text{Correction} = X_{n+1} - F_n(1) = e_{n+1}$$

(the error made in the forecast). In practice, this means that our forecast for  $X_{n+1}$  is (by substitution of  $n-1$  for  $n$  in equation (3))

$$F_n(1) = F_{n-1}(1) + (X_n - F_{n-1}(1)) = X_n$$

which is the last data value observed - for example, last year's sales or last week's prices. This last observation forecast is often referred to as the naive forecast in the literature. For noisy data series, however, it is better to dampen the fluctuations by use of a smoothing parameter,  $s$ , so that

$$F_n(1) = F_{n-1}(1) + s * (X_n - F_{n-1}(1)) \quad (4)$$

$$= (1 - s) * F_{n-1}(1) + s * X_n$$

This is called simple exponential smoothing. It has the obvious intuitive meaning (from equation (4)) that we include a portion of the previous forecast and a portion of the latest data value in computing the next forecast. The name is less obvious, and I refer interested readers to books on forecasting or time series analysis for an explanation. In evaluating formula (4), we need a parameter, called the smoothing parameter, which has been labeled  $s$ . Incidentally, we also need a first forecast value to start things off, but usually it is sufficient to use

$$F_1(1) = X_1$$

and begin at data point 2.

The smoothing parameter,  $s$ , is chosen by computing the mean squared error (MSE) of the forecasts. Recall

$$e_t = (X_t - F_{t-1}(1))$$

Then we define the MSE of the  $m$  last forecasts to be

$$\text{MSE} = (\sum_{j=0}^{k-1} e_{t-j})^2 / k$$

The MSE can be calculated for different values of  $s$  over the same data and the same value of  $s$  chosen to be that which minimizes the MSE. The mean squared error is a measure of the lack of "fit" of the forecasts to the data, so choosing the smallest MSE is equivalent to obtaining the best

t	$x_t$	$Z_t$ $= (x_t - x_{t-1})$	$y_t$ $= (x_t - T_t)$	$S_t$ $= (Y_t + Y_{t+12})$	$e_t$ $= (Y_t - S_t)$	5-point moving average of $e_t$
1	394		-13.7	-83.9	70.2	...
2	167	-227	-255.5	-240.7	-14.8	...
3	358	191	-79.3	-128.5	49.2	46.9
4	365	7	-87.1	-132.3	45.2	42.1
5	489	124	22.2	-62.5	84.7	41.5
6	593	104	111.4	65.2	46.2	32.6
7	691	98	194.6	212.4	-17.8	21.2
8	659	-32	147.8	143.1	4.7	10.9
9	546	-113	20.0	31.8	-11.8	19.2
10	691	145	150.2	117.1	33.2	29.2
11	703	12	147.5	59.8	87.7	14.2
12	621	-82	50.7	18.5	32.2	19.5
13	431	-190	-154.1	=S <sub>1</sub>	-70.2	3.1
14	374	-57	-225.9	=S <sub>2</sub>	14.8	-23.5
15	437	63	-177.7	=S <sub>3</sub>	-49.2	-46.9
16	452	15	-177.4	=S <sub>4</sub>	-45.2	-42.1
17	497	45	-147.2	=S <sub>5</sub>	-84.7	-41.5
18	678	181	19.0	=S <sub>6</sub>	-46.2	-32.6
19	904	226	230.2	=S <sub>7</sub>	17.8	-21.2
20	827	-77	138.4	=S <sub>8</sub>	-4.7	-10.9
21	747	-80	43.6	=S <sub>9</sub>	11.8	-19.2
22	802	55	83.9	=S <sub>10</sub>	-33.2	-29.2
23	705	-97	-27.9	=S <sub>11</sub>	-87.7	...
24	734	29	-13.7	=S <sub>12</sub>	-32.2	...
Sum:	13,865	340			0.0	

Average  $X_t = 13865 / 24 = 577.7$   
Average  $Z_t = b = 340 / 23 = 14.783$   
Intercept =  $a = -12.5 * b + X_{\text{average}} = 392.93$   
Trend line =  $T_t = a + b * t = 392.93 + 14.78 * t$

**Figure 1. Calculations involved in decomposition**

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fit of the model to the data. This criterion of fit is widely used in many modeling efforts, and is not confined to forecasting.

When there is long term trend in the data, this should be removed before smoothing is applied. Trend is easily accounted for by differencing the series. That is, if  $X_t$  is the original data as adjusted for trading days, etc., we form the new series

$$Z_t = X_t - X_{t-1}, t=2,3,\dots,n$$

The average increment from time period to time period in the series  $X$  is then

$$b = \left( \frac{\sum Z_t}{n-1} \right)$$

which yields the straight-line approximation to the original data as

$$X_t \approx a + b \times t$$

where  $a$  is the intercept parameter that may be calculated from the mean value of  $X_t$  via averaging of both sides of the last equation:

$$a + (n+1) \times b / 2 = \left( \frac{\sum X_t}{n} \right)$$

or

$$a = X_{\text{average}} - b \times (n+1)/2$$

Note that  $t = (n+1)/2$  is the middle time period of a series of  $n$  points. This is illustrated in the examples at the end of the article. The smoothing formulae are then applied to the (hopefully) stationary series of new values

$$Y_t = X_t - a - b \times t \quad (5)$$

which is again illustrated in the examples at the end of the article.

What we have computed in equation (5) is an expression of the time series values with the trend line removed. We could consider further decomposition of the time series. Typically, we would like our model to include trend, seasonality, long-term cycle and random components. We define these as:

*trend* — the long-term increase or decrease in the value of the values of the observed quantity;

*seasonality* — the regular variation of the values of the quantity observed with time of year (or day of week, or similar time period);

*cycle* — long-term regular up and down movement of values that cannot be called seasonal;

*randomness* — the variations in values that cannot be explained by this model, and are therefore assumed to be random fluctuations.

The decomposition is most easily considered to be an additive one

$$X_t = T_t + S_t + C_t + e_t \quad (6)$$

where

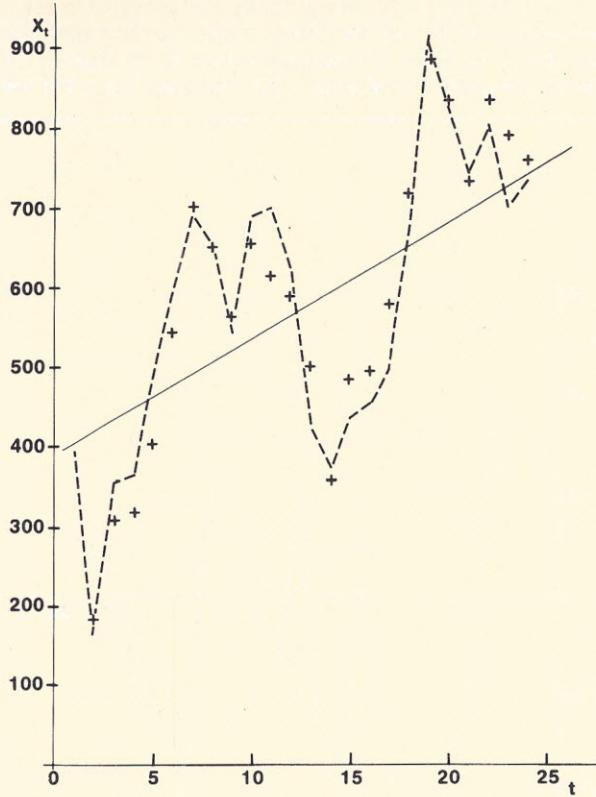
$$T_t = a + b \times t \quad (5a)$$

is the trend component and  $S_t$ ,  $C_t$  and  $e_t$  are seasonal, cycle and random components, respectively. In practice, it is more common to use a multiplicative model

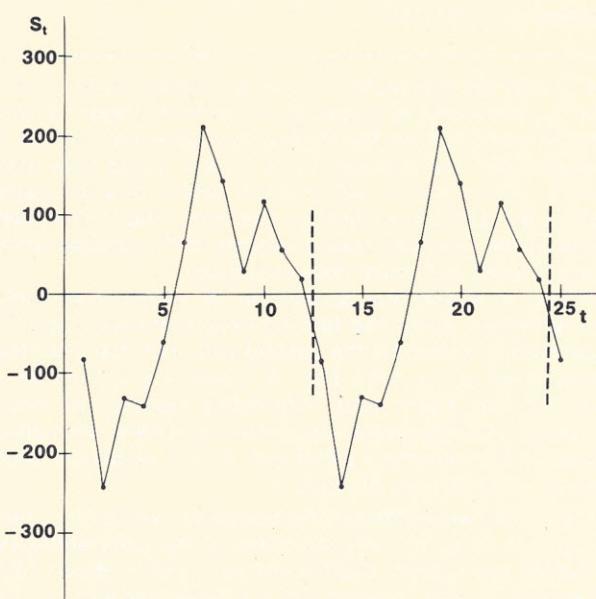
$$X_t = T'_t * S'_t * C'_t * E_t$$

where the prime ('') has been added to accent the fact that the components have very different values from those in the additive model and the factor  $E_t$  is no longer a residual. The widely used decomposition programs from the U.S. Bureau of the Census known as X-11 are reported to employ a multiplicative model. However, for simplicity, an additive model is used here.

How are the components evaluated? We have already seen how to get the trend by averaging a differenced series.



**Figure 2.** Decomposition of a time series (dashed line) as the sum of a trend line (solid line) and seasonal indices (figure 3). The model values are given by the plus signs (+).



**Figure 3.** Seasonal indices for the time series presented in figure 2. Note that the pattern repeats every 12 periods.

## STARTING YOUR OWN MICROCOMPUTER BUSINESS

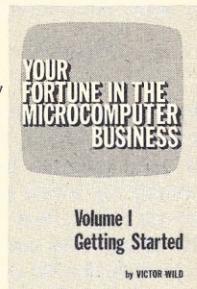
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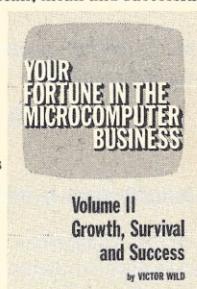


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Another way is to use simple least squares regression to calculate a trend line. Then, by subtraction as above, we have the new series

$$Y_t = X_t - T_t = S_t + C_t + e_t$$

The next component to be found is the seasonality. This is relatively straightforward if we know that the observed time series has some cause to be periodic. For instance, usage of home heating fuel in Canada will obviously increase in the winter months. When such patterns are not obvious from prior considerations or by inspection of plots of the data, so that the length  $L$  of the seasonality in time periods can be determined, we may choose to consider the series as non-seasonal and set the value of  $S_t$  as 0 in our model for all values of  $t$ . However, to illustrate the process, consider that we have a monthly series with annual pattern. That is, the length of seasonality,  $L$ , is 12. The seasonal components are then expressed as a set of 12 values, one for each month of the year. To get the January value, we average all values of  $Y_t$  that correspond to January; for February, all February values, and so on. Note that we have the obvious result

$$S_{t+12} = S_t$$

By again subtracting, we obtain

$$W_t = Y_t - S_t = X_t - T_t - S_t = C_t + e_t$$

Finding the cycle requires careful examination of the  $W_t$  values or graphs thereof. Expressing the cycle mathematically may be quite difficult, but fortunately we only wish to project it forward for a few periods for our forecasting purposes and can do this by eye and hand quite well. To help in visualizing the cycle, one can apply a moving average or smoothing formula to the  $W_t$  series. In doing this with a moving average, it is a good idea to attribute the value obtained from the averaging process to the middle time point of those averaged. For example, if five points are used in the averages, we assign

$$C_t = (W_{t-2} + W_{t-1} + W_t + W_{t+1} + W_{t+2}) / 5 \quad (7)$$

The residual random component is then calculated by a final subtraction

$$e_t = W_t - C_t = X_t - T_t - S_t - C_t \quad (8)$$

### Complicated procedure

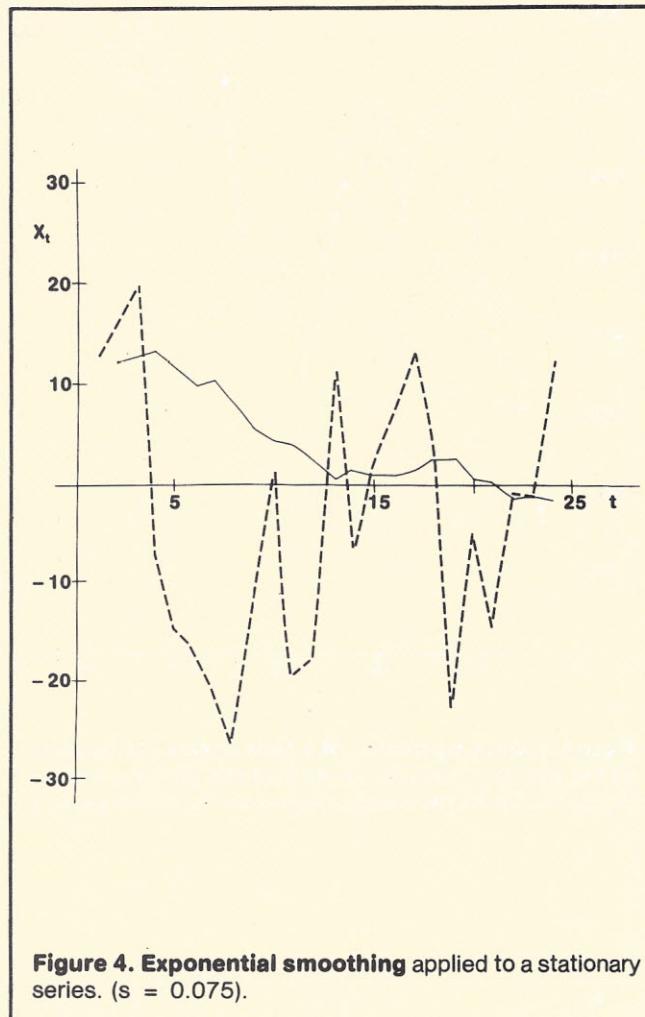
Most production program codes extend the process just presented to transfer some weight between the components in small amounts until the "fit," as measured by the mean squared error (MSE) and other criteria, is satisfactory. While these processes are largely heuristic, the details are complicated—both in procedure and justification, and the documentation can be voluminous.

How do we forecast with such a decomposition model? Quite simply, each component is forecast individually, and these values are then combined to give a value for the forecast of the original series at some time point. The trend is extrapolated by substituting an appropriate value for  $t$  in equation (5a). The seasonality is fixed as well by the value of  $t$ . We only need to work out which month (season, week, quarter, etc.)  $t$  corresponds to. The cycle is extrapolated graphically if no mathematical expression is available, and for most applications this suffices. The random component is taken as 0—our best guess for this unpredictable part of the variation of the time series. Thus, if  $T$  is the last time point for which there is an observation, the  $m$  period ahead forecast is

$$F_t(m) = a + b * (T + m) + S_{(T+m)} + C_{(T+m)} \quad (9)$$

Decomposition is illustrated in figures 1-3. the raw data ( $x_t$ ) is differenced to give the series  $Z_t$ , which is averaged to

compute a trend line at the bottom of the table. The trend is then subtracted from the data to give a new (stationary) series  $Y_t$  in the fourth column of the table. By averaging elements of  $Y_t$  corresponding to the same month, the seasonal indices  $S_t$  are found (column 5 of the table). These are then subtracted from the  $Y_t$  to leave the residual errors  $e_t$ . In figure 2, the dashed line gives the initial data ( $X_t$ ). The solid line is the trend



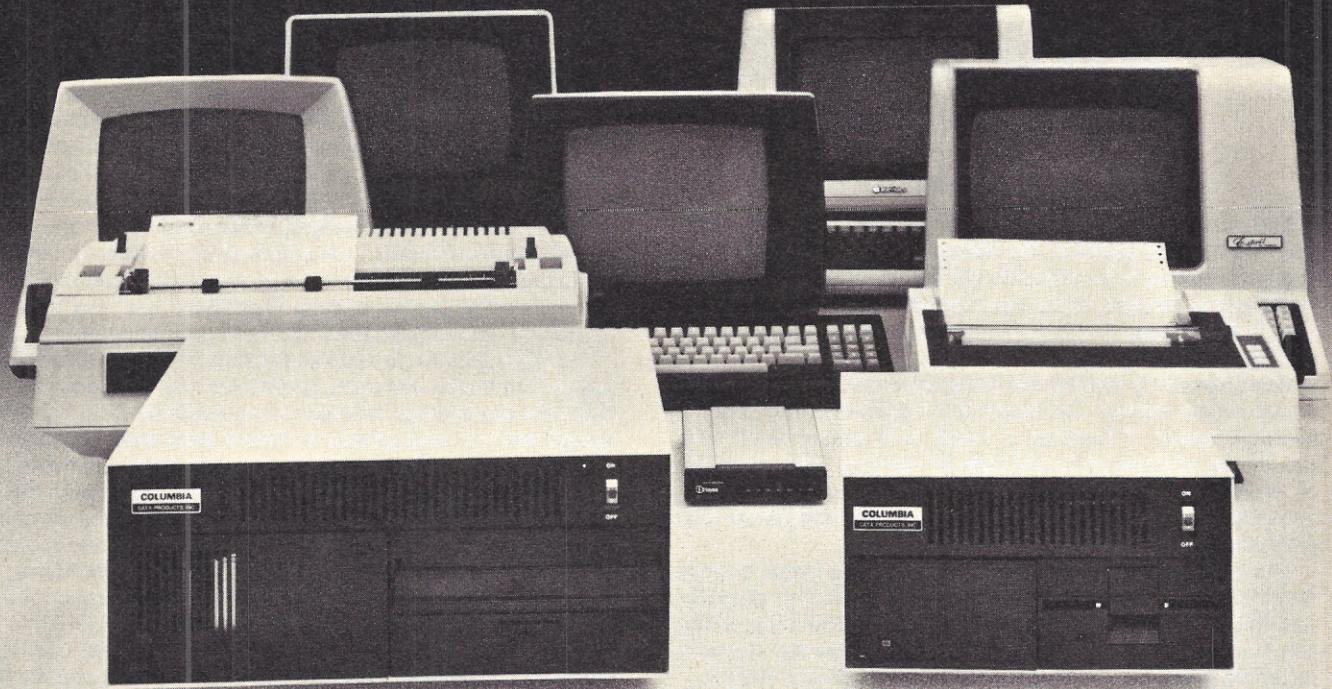
**Figure 4. Exponential smoothing applied to a stationary series. ( $s = 0.075$ ).**

line  $T_t$ , and the plus signs (+) give the model values, that is:  $T_t + S_t$ . The seasonal indices  $S_t$  are plotted in figure 3. Note that the model follows the original data quite well. We could, however, plot the residual errors  $e_t$  and would note some pattern, a slow cycle, still present, with a positive weight early in the data and a negative one later. This is also made visible by the five-point moving average of the residual series, which is given as the last column in figure 1.

Figure 4 shows the application of simple exponential smoothing to a series that had the trend removed. Again, the initial data is shown by the dashed line, with the smoothed series given as a solid line. A smoothing parameter of  $s = 0.075$  has been used. Interested readers will find it instructive to apply simple exponential smoothing with various values of the smoothing parameter,  $s$ , to a stationary series such as either  $Y_t$  or  $e_t$  of figure 1.

For a somewhat different discussion of forecasting, with a program in Basic to carry out some of the calculations discussed in this column, see the article by Leo P. Biese, M.D., "Forecast: Volume Projection for the Small Business" (IA Dec 79). In order to understand what is going on in the various stages of smoothing or decomposition, however, I strongly recommend coding the formulae and playing with the data. Even if a production code does not result, the experience gained in the process of performing the calculations is valuable when using programs written by others. □

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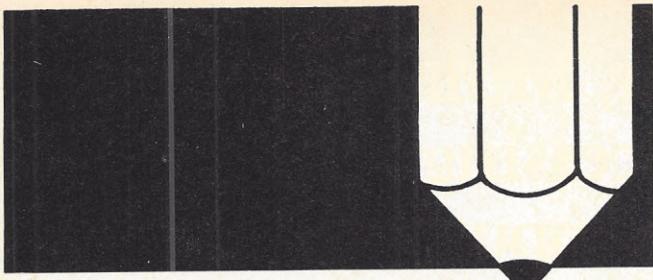
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# Learning with Micros

by Louis E. Frenzel, Jr.

## IBM in the Educational Market

The introduction of the IBM Personal Computer was probably the biggest event in the microcomputer field last year. Everyone seems to be interested in this machine. I have been giving some thought to the new system, particularly with regard to the impact that it might have on education. My initial reaction is quite favorable.

The IBM unit is among the more advanced personal computers on the market. The heart of the system is Intel's 8088 microprocessor. It features a 16-bit ALU with an 8-bit data bus. It can address up to 1M byte of memory. The capability of processing 16-bit words gives the system an edge in speed and power over most other personal computers with 8-bit processors.

The system comes with 40K bytes of ROM, which contain Basic and other systems programs such as built-in diagnostics. In its smallest configuration, the unit has 16K RAM, which can be expanded to 256K bytes. This is greater memory capability than any personal computer now on the market.

For mass storage, the IBM PC uses a simple audio cassette interface in its minimum configuration. However, I doubt that many people will use the machine in this form. Most users will go for at least one of two possible floppy disk drives, each with a 160,000 character storage capacity. All of this is housed in a single cabinet with power supply. Connected to it by a coil cord is the 83-key ASCII keyboard. As for a display, there are two choices. A user can select the monochrome display containing a high resolution 12-in. green CRT. The format is 25 eighty-column lines with both upper and lower case letters and a variety of special graphics characters. The other display option is a color monitor. With the appropriate color graphics interface and an RGB color CRT, some excellent color graphics can be created.

Finally, the IBM offers only one peripheral option: a dot matrix printer. However, standard interfaces (i.e. RS-232) are available, so that other peripheral devices can be attached.

The initial software offering is somewhat meager as you might suspect for a brand new machine like this. But there is at least enough software to get you started. Basic is contained in the main 40K system ROM. An advanced Basic is also available with the unit's disk operating system. Other software available includes the Peachtree and BPI business and accounting packages, Personal Software's VisiCalc and the Easywriter word processing software.

Overall, the system is well balanced. It contains no major technological innovations, but is more advanced in almost every way than any other personal computer on the market. And the best news of all is the price. While price varies considerably with the configuration, it is quite competitive with the Apple II and III, the TRS-80 and other popular machines. Predictions are that the IBM Micro will become the best-selling personal computer. I think that will also be true in the field of education.

Today many schools are buying personal computers for use in the classroom. Several offer computer literacy programs of some kind. And some schools are using personal computers for actual teaching chores. A lot of CAI lesson material is now available, and teacher-generated exams are becoming more popular every day. However, while many schools are buying personal computers, their use is really not as widespread as might be expected. Many schools have resisted the microcomputer movement because of price or the lack of knowledge about computers and what they can do. As prices drop and as administrators and teachers become more familiar with computers, schools will be buying more computers and discovering their benefits.

It is my opinion that the IBM micro will help this movement. While Apple, Radio Shack and others have sold hard and attempted to educate the academic community, these companies have met with only modest success. It is possible that the schools are resisting these "unknown" manufacturers. While those familiar with personal computers will recognize Apple and Radio Shack as the top micro manufacturers, a teacher in Podunk, KS, is probably asking, "Who are those guys?" But that teacher certainly knows IBM—the name is recognized and respected. I am sure that this familiar and trusted name will encourage more schools to buy computers. A lot of micro industry people believe that IBM's unit has blessed, sanctioned and legitimatized the personal computer business.

The IBM system also has a lot going for it in an educational sense, but it also has some problems. The main drawback is that little educational software is yet available. IBM has introduced several educational software packages recently, including Microsoft's Typing Tutor and three mathematics programs developed by Science Research Associates (SRA). While these are certainly not enough to justify the purchase of the IBM system, it does indicate IBM's commitment to education. Teachers simply can't develop their own software, so it is doubtful that the IBM unit will make much penetration into the schools until more software is available. While that's an initial disadvantage, I don't think we will have to wait long before there will be a tremendous flood of software for this machine. Much of the existing software will no doubt be converted to IBM format to get some initial products flowing. Beyond that, many new software packages will be created to take advantage of the unique capabilities of the system.

While educational software can be written in Basic, it would be nice if special educational software were available. Maybe someone will do PILOT for the IBM system. A good authoring language would do a lot toward encouraging the development of CAI.

And maybe the system will stimulate more activity in the adult and industrial education areas. One of the greater potentials for CAI is in the adult continuing education and industrial training fields. With some development software or authoring languages, this could happen faster.

While the IBM micro looks like a dandy for education, it's going to be a while before it really begins to show up in numbers. IBM seems to be production-limited at the present, but I'm sure that will be solved when the demand warrants it. But more important, the Apples and TRS-80s are well entrenched in schools now and there is a tremendous amount of educational software presently available for them. While Apple and Tandy have a big lead, you can expect it to be eroded somewhat as the IBM unit really takes off.

One final note: IBM sells the Personal Computer through its product centers, Computerland stores and Sears business machine stores. Apples and TRS-80s are also sold primarily through computer stores. However, IBM also has a sales force that will sell its units to schools. Other personal computer manufacturers do not typically sell with reps, even though that is the method most familiar to school personnel. With the exception of Heath/Zenith, with its ZDS Z89s, only IBM is taking such an approach. This will be another factor in its successful penetration of the educational market. □

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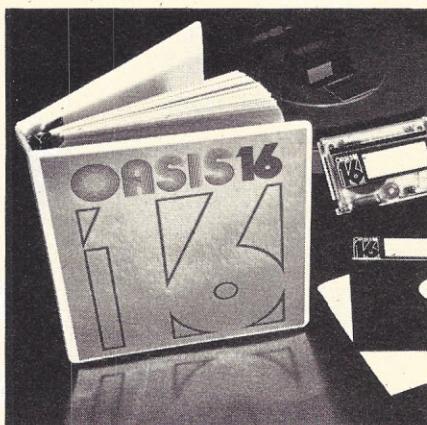
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# APPLE-CATIONS

by Tony Dirksen

## **Word Processing Languages**

Before I started using a personal computer, I could destroy a forest of paper producing even a short article. False starts, misspellings, and poorly-turned phrases created reams of copy destined to incinerators instead of editors' desks.

But working on a word processor allows me to make my mistakes electronically, and correct them automatically. Recently, I tested Apple's newest word processing programs: Apple Writer 2.0 (for the Apple II) and Apple Writer 3.0 (Apple III version). Similar in design, the programs offer features not included in the original Apple Writer, including the availability of 80-column upper/lower case display on the Apple II (standard on the Apple III), along with a choice of type fonts and an inverse display option on the Apple III. Both programs have built-in functions that provide tabs, underlining, automatic print formatting, shorthand data entry and split screen display.

Both versions also contain a "word processing language" called WPL, which allows the user to automate many word processing functions. It allows you to utilize Apple Writer for specialized needs such as printing files in sequence, creating form letters, automatically transferring files between disks, and replacing strings of words or phrases across multiple files. (All of these programs, incidentally, are included on the Apple Writer diskette and in the manual.)

Since it's built primarily from standard Apple Writer commands, anyone who's learned the main program can immediately begin putting WPL to use. In addition, WPL includes several special features such as variables, subroutines, and the ability to compare strings of words or characters. This allows the user to construct more advanced applications. Because of these programming tools, WPL makes it possible for a user to implement many of the advanced features formerly found only on dedicated word processing systems.

To create a WPL program, you simply enter commands into the Apple Writer text editor the same way you enter text. Each command is on a separate line; the first character of every command represents a standard Apple Writer control character. Additional characters on each line let you make your commands more specific. For example, if you wanted your program to load a file named "magic" from disk drive number 2, you would type:

L .d2/magic

on the Apple III, and

L magic,d2

## on the Apple II.

The first character on every line is either a space or a label. Labels allow you to create loops so specific tasks can be repeated (such as changing the address on a form letter) while under program control. The new Apple Writer allows you to load and save portions of files, so you can load each address

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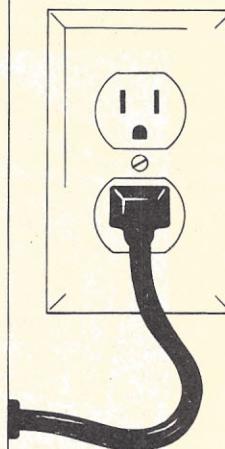
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from the disk individually.

The two programs detailed here demonstrate how a WPL program is put together. Both will run on the Apple II or III.

### Word.Counter

Word.Counter gives a close approximation of how many words are in an Apple Writer text file. It defines words as "characters between spaces." But it is not able to determine whether those characters are letters or numbers. Basically, the program counts words as the total number of spaces in the story, after accounting for double spaces between sentences and hyphenated words (which are usually counted as separate words).

The new Apple Writer provides a data line along the top row of the screen that shows the remaining memory, total length of the file in memory, your current position in that file, the name of the file and other information. It's possible while working on a file to make a reasonable guess of the total number of words in it by dividing the total file length by five. For closer calculations, however, (for instance, if you're a writer paid by the word), the program gives a far more exact calculation.

This program demonstrates how user input, variables, and program loops work under WPL control. Commentary in parentheses describes what functions are being performed; it should not be typed as part of the program. At first glance, it may all look a bit complicated, especially if you're not familiar with Apple Writer. Many of these, however, are standard program segments that can be repeated as shown here from program to program. In fact, since Apple Writer allows you to link files together, you can keep oft-used program segments on disk and call them up when you need them.

START NY  
PND  
PPR

(In Apple II version, the above line is typed "PPR control-V control-L control-V." In the Apple III version, a control-backslash replaces the control-L. The lines clear memory and the screen, and turn off the text display during operation of the program. It's possible—although slower—to display your text while operating the program.)

PPR This program will count the total number of words in a file  
PIN Enter name of file : = \$A

(The first line prints to the screen; the second prints and waits for user input. The user input is assigned to one of the four WPL string variables.)

PCS/\$A//  
PQT

(The first line examines the user input, comparing it with a string made up of nothing. If the user has input a file name, the program defines the first line as "false" and skips the next line, continuing with the program. If the user is finished (and thus has not input a file name), the program defines the first line as "true" and reads the second line, which tells it to stop operation and return to the text editor.)

LOADER NY  
L \$A  
PGO SETUP  
PGO START

(This section loads the file the user wants to examine. If the file is on the disk, it proceeds to the SETUP label. If the file cannot be found on the disk, the program allows the user to ask for another file name.)

SETUP B  
PSX 0

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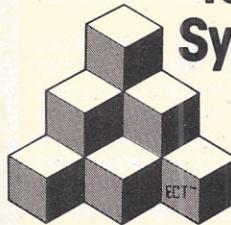
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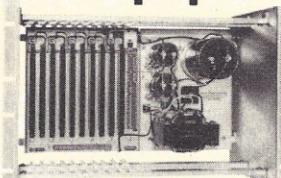
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(The above lines move the cursor to the beginning of the file in memory, and set the WPL variable X to zero. WPL provides three integer variables.)

F/-/ /a  
PGO CONT1  
CONT1 F/-/ /a  
PGO CONT2  
CONT2 F/ / /a

(These lines automatically survey the file and replace dashes, hyphens, and double spaces—such as those between sentences—with single spaces.)

EXAMINE F/ / /  
Y?  
PGO COUNTER  
PGO TOTAL  
COUNTER PSX + 1  
PGO EXAMINE  
TOTAL PIN Total number of words in story "\$A" =(X)  
(Press RETURN)  
PGO START

(This section is actually the heart of the program. It finds each space, counts a word by increasing the X variable by one, and returns to look for another space. When it reaches the end of the file, it prints the total number of words and returns to the beginning, so you can examine another file. The actual counting of words can take a few minutes on longer files.)

QUIT PIN End of word count. (Press RETURN)

### WPL.Data base

One of the frustrations I've found in the past with using computerized data bases is that they are not linked directly into the word processing program that's normally running on my system. To examine the data base, I have to exit the word processor, boot up the data base program, follow a new command structure to search and edit through the data base, print out the information I want, reboot the word processing program, and type in information from the data base.

This is all very complicated—and, with WPL, unnecessary. I've created a simple WPL-based data base that allows me to maintain a simple records file, using the standard Apple Writer commands to search, add, delete and print records. It certainly does not have the sophistication, sorting capabilities, or program speed of any commercially available data base, but it does allow me to get to the information I want when I want it, using the program command structure with which I'm most familiar. In addition, since it's possible to convert Apple Writer II files into Apple Writer III files and vice versa on the Apple III, I can transport the data base back and forth between the two machines.

(Once again, I've included a few notes in parentheses that should not be included if you input the program yourself.)

START NY  
PND  
PPR  
PPR \*\*\*\*\* WPL DATABASE \*\*\*\*\*  
PPR  
PPR Select from:  
PPR  
PPR (A) Add a listing  
PPR (B) Delete a listing  
PPR (C) Search for a listing  
PPR (Q) Quit  
PPR  
PIN Select : = \$A  
PCS /\$A/Q/  
PQT

PCS /\$A/q/  
 PQT  
 PCS /\$A/A/  
 PGO ADD  
 PCS /\$A/a/  
 PGO ADD  
 PCS /\$A/B/  
 PGO DELETE  
 PCS /\$A/b/  
 PGO DELETE  
 PCS /\$A/C/  
 PGO SEARCH  
 PCS /\$A/c/  
 PGO SEARCH

(These lines provide a menu of options, and accept either upper or lower case responses from the person using the program.)

#### ADD

PPR  
 PIN What datafile? = \$B  
 NY  
 L \$B  
 L \$B.Template  
 PGO QUIT

(These lines load in the datafile, and place a template at the end of it for adding a new listing. The template should be named with the title of the datafile, followed by a period and the word "template," as in "Wine.Template" for a "Wine" datafile. Once you've entered the data into the template, you can save it by typing "control-S" followed by an equal sign, which will save it as part of the original datafile.)

#### DELETE PPR

PIN Delete from what datafile? = \$B  
 PIN Delete what listing? = \$C  
 L \$B  
 B  
 F/\$C/\$C/  
 Y?  
 PGO QUIT

(This section of the program finds a particular listing within the datafile so you can delete it with Apple Writer commands. After the deletion is completed, you should save the new version of the datafile as described in the "Add" section above.)

#### SEARCH PPR

PIN What datafile to search? = \$B  
 PIN Search for what listing? = \$C  
 L \$B  
 B  
 F/\$C/\$C/  
 Y?

(This section will find the first listing in the datafile that matches your specification. If you want to search from the end of the file, the "B" command should be changed to "E". You can search for additional listings by using Apple Writer's "find" command. As in any data base, developing a good template is critical. You may want to develop a "Search" key in the template—say, a header preceded by the word "SEARCH:"—so you can find the data you want more quickly. If you did that in the above program, you could replace the F/\$C/\$C/ line with F/SEARCH:\$C/SEARCH:\$C/ to help you get to the data you want.)

#### QUIT PPR

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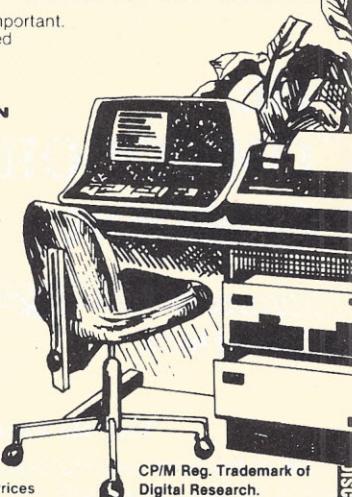
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by Mike Heck



## VisiCalc Applications

One of the most powerful uses of a microcomputer in business is for financial analysis and planning. The computer can provide an immediate look at the shape of your business and guide your plans for the future.

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VisiCalc, by Software Arts, distributed by Personal Soft-

ware, Sunnyvale, CA, is such a forecasting tool. It is just about the best-selling program for microcomputers.

In essence, VisiCalc is an electronic worksheet extending 63 columns by 254 rows. At each coordinate of a row and column, you can "write" in a value, a label/heading, or a formula that refers back to some other coordinate or coordinates. But the recall power of the program is that it will automatically recalculate all the figures on the sheet if you change any entry. This feature lets you effortlessly look at several alternatives as you plan a project. What follows is a brief overview of VisiCalc applications on Commodore equipment.

The standard VisiCalc will operate on any Pet or CBM computer with a minimum of 32K memory. When the program is loaded, it automatically checks to see which computer you are using (either 40- or 80-column) and loads the proper version. Using VisiCalc with a CBM 8032 enables you to use the whole 80-columns to display information. When dealing with a lot of data, this is an important plus. Using VisiCalc on a 40-column Pet is not really a limitation; you just view only half as many columns as the 8000 version.

The one negative to VisiCalc on Commodore equipment is available user memory to hold the work sheet data. VisiCalc itself occupies about 22K of memory, leaving only 10K for data storage. In reality, only modest spread sheets can be constructed in 10K. A way around this is to design your VisiCalc application in sections and save those sections on disk under various names. The drawback to this partitioning technique is that one section can't access data from the other sections very easily.

The answer is an extended VisiCalc designed to work with add-on memory boards available for the Commodore CBM 8032. These boards take many forms and are available from Commodore (64K add-on and internal 64K RAM of SuperPet), a 256K external expansion box (which is available in Europe) and the 64K CP/M Softbox from Lifeboat Associates, New York, NY, to name just a few. The 256K add-on currently sup-

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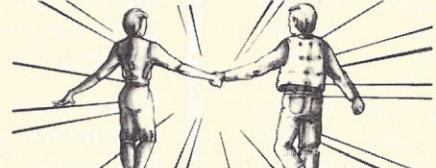
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ports a VisiCalc with 41K free for workspace. You can still do a great deal of work with the 32K version of VisiCalc on either PET or CBM systems.

When first running VisiCalc, the user is presented with a two-line status area on the top of the screen. Directly below the status area are columns, labeled A through BK. Rows are numbered 1 to 254, and run vertically down the left side of the screen. Naturally, you can only see part of the work area

## The relocation feature lets you effortlessly look at several alternatives as you plan a project.

at any time. On an 80-column display, you normally view an 8-column by 21 row area.

Except for a "cursor," which is a reversed bar the width of one column, positioned at location A1 (the upper left-hand corner of the work area), the rest of the display and entire work area are empty. The top status line will also show "A1," indicating the cursor position.

On the right side is another number, usually 10 in the standard program, indicating the amount of memory available for your data. As you enter information, this number will decrease. Use it as a guide in creating your sheet. As it becomes small, 1-2, it's time to think about saving the sheet and starting a new one.

Depressing the "/" key displays "BCDFGIMPRSTVW-" on the status line. These are single letter abbreviations for the various VisiCalc commands. For those not familiar with the program, the respective commands are: BLANK, CLEAR, DELETE, FORMAT, GLOBAL, INSERT, MOVE, PRINT, REPLICATE, STORAGE, TITLE, VERSION, WINDOW, and LABEL. VisiCalc also contains a number of built-in functions that will be used extensively. These include the usual arithmetic operators, plus MIN, MAX, COUNT, AVERAGE, transcendental functions and graphing. Let's discuss the commands needed to create the sample sheet presented here.

Using VisiCalc involves entering information on the sheet in the appropriate location. You can position the cursor at any place on the sheet by using the cursor keys on the keyboard. The cursor up/down key moves you vertically through the rows and the cursor left/right moves you back and forth through the columns. You can enter a number or alphanumeric label at any cursor position by simply typing the information and hitting RETURN.

Normally, rows and columns are labeled with headings first, then corresponding information is entered. For example, if the second column is for January and the third row represents sales for the month, you would enter the sales figure at the intersection of the appropriate column and row, in this case B3.

Once information is entered, you will probably want to do some math operations with the data. Using the addition

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function, the sum of all elements in a column can be placed at the bottom of the column with one step. If your costs for the month of January were contained in locations B12 through B24, at location B26 you could type:

@SUM(B12 . . . B24)

Location B26 would immediately display the sum of those 13 entries.

The accompanying sample printout is part of a sheet designed for an advertising agency so it could obtain an immediate view of how the business was going. Because the various elements on the sheet are related in some fashion by placing formulas at various coordinates, changing any cost item will display the effect it would have on that month's profit/loss, and the year-to-date figures.

Fixed costs for doing business are similar for most organizations, even though the names change. Items like salaries, personnel costs, occupancy, travel and general costs such as rent are fairly universal. And every business must have a source of revenue. In most cases it comes from sales. However, advertising agencies rely on a percentage of the gross cost of ads they place for clients as the major source of revenue. This is their commission.

This second section of the sheet that takes the gross billings and converts them into revenue is an extra step that most people would not use. Associated with this second area is a "look-up" table that contains the commission rate for each client. Basically, the sheet is set-up to multiply the figure for gross billings by the corresponding rate to arrive at revenue produced by each client, by month. Eliminating these two sections, and making the revenue section reflect your business, this sample sheet could be customized to fit many situations. Depending on how many entries you want to make in each sub-category and how many months it entails, you should be able to fit this sheet in memory at one time.

If additional space is needed, each cost area could be a separate sheet on disk. However, you lose some flexibility in being able to add up and display bottom line figures immediately. The figures from each category would have to be transferred from each individual cost sheet to a summary sheet that does the final tallying. In creating this sheet, the first thing was to label the columns across the top with the months of the year. The original sheet contains all twelve months. The final column is a total of all rows across any particular month.

The next step was to label the rows with the appropriate title. As mentioned, the specific items used here might not exactly match your unique situation, but you could probably follow the general categories I used. Setting these titles involved nothing more than typing the heading at the right location and using the cursor keys to go on to the next spot.

### Improving appearance

A VisiCalc command, “-” (the repeating label), was used to create the dotted lines and other break points. These are optional. However, they do make for a more professional-looking listing. If you have the memory space, it's a good idea to separate things a bit.

Another VisiCalc command, “R” (replicate), was used to reproduce the label across all the rows.

At the bottom of each category, the addition (or SUM) command was used to add up parts of each column. For example, on this sheet the January gross billings for the clients are contained in locations B9 through B18. At location B20, the following was typed to get the month's gross billings:

@SUM(B9 . . . B18)

With the cursor at B20, the replicate command was used to replicate that formula at location C20 through M20. When you use the replicate command, VisiCalc first asks for the source range. Just hit return and B20 will be displayed. Now,

the target range will be asked for. You can either type the coordinates of the starting and ending column number or move the cursor to each location and enter the location by hitting return.

VisiCalc next responds with the coordinate B20 highlighted and the prompt "Relative or No change." Hit R for relative. We want the sum at the bottom of column C to reflect the sum of C9 through C18, not figures in column B, and so on. The revised formula is immediately reproduced at location C20 through the ending column specified, relative to each column.

### Building the Revenue section

In the sample, the Revenue section was constructed by writing a formula that took the gross billings, multiplied that figure by the corresponding commission rate for each client, then placing the resulting figure in the spot for revenues.

During development, this was the most time-consuming part of the whole project. Each revenue figure had to reflect the proper client in the section above it. The replicate command was used extensively to construct each formula and make it relative to the proper location in the gross billing section, while not changing the commission rate.

Even though many clients have the same commission rate, the look-up table was constructed in this fashion, so the rate for one client could be changed without affecting all others.

For most uses, you would not even go through any of this. A single figure for revenue would be entered in the month column. But it does illustrate an important point. For this client, the calculation of revenue by hand was a real chore. Having the program do it saves many hours and ensures accurate results. Perhaps your business has a unique need that VisiCalc can answer.

In each cost area, the SUM command was used to total the categories by row and column. This was straightforward. The replicate command, once again, made things move very quickly once the initial formula was created.

The Total Expenses row takes the sum of each cost category. The formula is simply:

$@SUM(B55 + B71 + B81 + B95 + B107 + B128 + B130)$

Of course, in your case the coordinates will reflect the location you selected for various categories. The above formula just adds up the sub-totals in each cost category. The replicate command was used again to place this formula in locations C134 to M134, providing total costs for each month. In this case, VisiCalc will ask the "Relative or No Change" question for each entry in the formula. They should all be relative.

The final, and most important row is the Profit/Loss calculation, but it is also the easiest formula. This is merely taking the revenue for each month and subtracting the costs. The formula on this sample sheet is:

$+ B37 - B134$

This is, again, replicated across all columns, relative to each column, to arrive at the bottom line figure for each month and the year.

In actual use, the gross billing figures are entered and VisiCalc automatically does the conversion into revenue. Actual fixed costs are also entered. Profit/loss figures are then instantly displayed, without having to refer to detailed income and balance sheet statements.

But the most important thing is that projections can now be made by changing billing or cost figures. In changing any one, the effect on all others is shown instantly. In planning during these uncertain times, this may be the most important edge you have. It's that simple...and that complex.

By showing a sample VisiCalc sheet that is providing this edge in daily operation, perhaps you'll take a look at how the same thing could apply to any number of businesses, large or small. □

**Sample worksheet on page 150**

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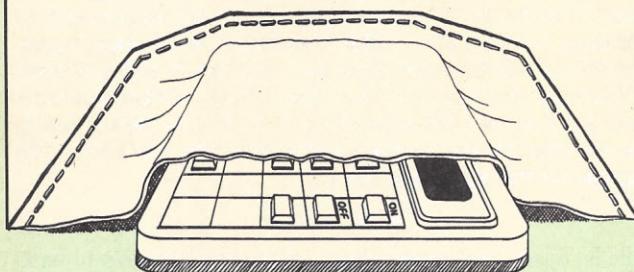
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# POWER IN YOUR POCKET

by Bob McElwain



## A Peek at the Panasonic

It's here! I saw a Panasonic handheld computer just the other day. And it works. (Panasonic and Quasar are both built by Matsushita of Japan and differ only cosmetically.) At the time it was the only machine in Los Angeles, but I was assured more would be here soon. I did not have an opportunity to work with the unit. However, I was able to talk with someone who had.

Gene Sprouse is the President of Rainbow Computing, Northridge, CA. He got started in the retail computer business when micros were new. In this extremely competitive environment, he's built a very successful business. He's working with Apple computers supporting solid business systems, while maintaining a heavy interest in personal computing.

The configuration I saw consisted of the computer, add-on memory, modem, RS-232 interface, video interface, and printer. Assembled in a slim-line briefcase, this configuration will retail at approximately \$2,000.

At present, the computer holds four 2K ROMs, easily interchanged, that permit the use of canned software. The ROMs will soon be 4K each, giving a total of 16K program space in the computer itself. 8K chips are expected that will give 64K. The external memory module is presently 8K and will soon be 16K. Several such modules can be added. The computer itself is roughly an inch taller and longer than a pocket computer and a little more than twice as thick. It's



Quasar model

powered by NiCad batteries that should operate for six or more hours without recharging.

Sprouse feels this computer is in many respects faster and more powerful than the Apple. (They both use the same processor chip, the 6502.) He's particularly impressed with the engineering and performance. Careful thought has preceded the production of this computer. For example, you can disconnect any component of the system at any time without destroying information or damaging the system in any way. The computer beeps politely if it needs anything, even a battery change.

Sprouse believes the initial applications of this computer will be data acquisition. The computer will be used in the field to gather a variety of information. This data can be transmitted to a central site from any telephone. Or the unit can be brought to an office and connected to available peripherals for processing. Extensive efforts are being made to implement such applications as soon as possible. In short, Sprouse is very impressed. He sees a bright future for Panasonic and plans to be a part of it.

## Some reservations

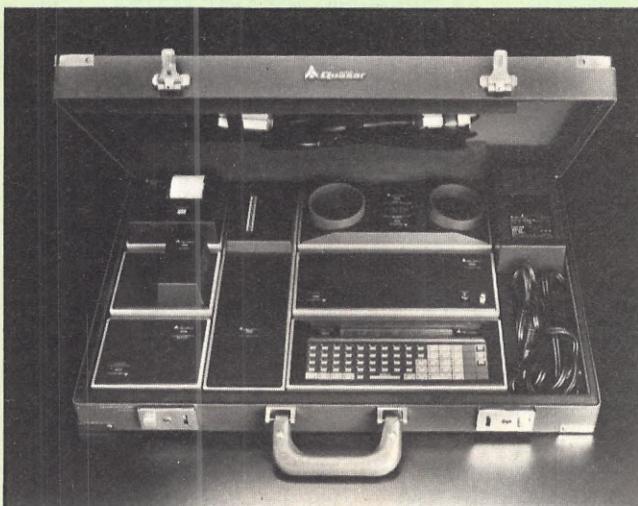
I'm not as excited. I was looking for the highly touted personal computer announced some time ago. As a business system, the Quasar/Panasonic can be significant. (Lack of application software will hold it back for now.) As a personal computer, Quasar/Panasonic does not make it. Although, powerful, it's expensive and does not lend itself to personal use.

It's designed to run canned software. Personal tinkering is not encouraged by system design. For example, there is no inexpensive way to develop your own software. In order to save a program, you'd have to dump to high speed cassette, use a modem to another computer or wait for a disk drive to become available.

Most people will use software burned in ROM. These chips are likely to be priced closer to \$100 each, rather than \$50. Even a modest library of programs could cost a lot of money.

Another highly advertised personal application is the use of the modem in order to communicate with various data nets. A video interface gets around the problem of the single line that can be displayed directly on the computer. However, the use of this computer in this mode seems contrived. Much less expensive systems are available that interface with data nets more effectively than this system can.

Whatever success is headed for this new computer, it will begin with data acquisition and other business applications. Personal applications will be limited. It seems highly unlikely that people will buy this system as a personal computer. The price is high and software is higher. People with personal computing needs will acquire inexpensive and handheld computers and small micro systems designed to treat them kindly.



The Quasar HHC with peripherals, including a memory module, RS-232 interface, thermal printer, modem and video interface.

**Table 1: Data with 3, 5 and 7-day moving averages**

PER #	1	2	3	4	5	6	7	8	9	10	11	12	13
DATA	8.17	2.24	1.42	8.24	2.36	4.17	5.07	3.77	4.68	5.74	4.83	6.84	5.97
PER #			1	2	3	4	5	6	7	8	9	10	11
3-DAY AVE	—	—	3.94	3.97	4.01	4.92	3.87	4.34	4.51	4.73	5.08	5.80	5.88
PER #				1	2	3	4	5	6	7	8	9	
5-DAY AVE	—	—	—	—	4.49	3.69	4.25	4.72	4.01	4.69	4.82	5.17	5.61
PER #						1	2	3	4	5	6	7	
7-DAY AVE	—	—	—	—	—	—	4.52	3.90	4.24	4.86	4.37	5.01	5.27

### Moving or rolling averages

Suppose you're tracking gross sales daily (or commissions, stock quotations, etc.). You probably jot down the day's figures and consider the resulting sequence in a number of ways. Patterns are not always clear. Consider the following set of data: 1-8.17 2-2.24 3-1.42 4-8.24 5-2.36 6-4.17 7-5.07 8-3.77 9-4.68 10-5.74 11-4.83 12-6.84 13-5.97.

The trend to this set of data may not be obvious. A moving or rolling average is often helpful. In table 1, moving averages for 3, 5 and 7-days have been computed for the above. These averages clearly show an increase of approximately 20%. A moving average tends to smooth out peaks. This smoothing is what brings a trend into focus, if any trend exists.

The average tends to lag behind current data, below or above, depending upon whether the trend is up or down. The greater the number of periods averaged, the greater the lag. One of the classic signals of trend reversal occurs at the point the plot of the current data crosses that of the trend line.

To use the notion of trend-line crossing, it's useful to explore the number of periods averaged. For some data and certain applications, a three-day average is best. For others, a longer period is better.

The program below provides three options with which to explore moving averages on a set of data. With the edit option, data can be edited or entered as needed. In this section, a "number of periods to be averaged" can be set to be used in the "Add Data" segment.

When data is added, the last N-day average is computed, using N periods as established in the edit segment. Data is added without changing previous data until the array is full. Thereafter, data is rolled back one period (the earliest item is discarded) and the new data inserted in the last position in the array.

Another segment, Run Aves, provides for examining the data with varying numbers of periods averaged. This allows selection of the N-day period that seems to best suit the data and application.

As listed, the program leaves room for 54 data items. Much of the code is to assure accuracy of entry and procedures. I personally make lots of mistakes and need a forgiving system. Further, since I don't use the program often, I need directions in the code. If you need room for more data, much of this code can be deleted. As written, the PRINT statements are necessary if a printer is used. Here are the lines that can be deleted easily, with required changes for branch statement addresses: 15 (move line 25 to 15), 20, 100 and 105 (move line 110 to 100) 145 (move line 150 to 145), 165, 180, 185, 230, 300 (move 305 to 300), 310, 320, 330, 400 (move 410 to 400). In line 425, change 405 to 400, 430 (move 440 to 430). □

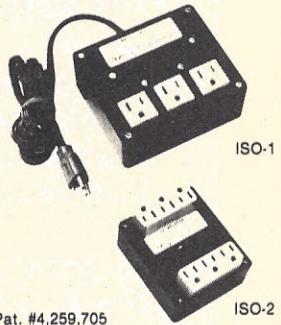
**Program on page 154**

**Table 2. Variable names**

- A = Number of data items that memory can hold with the program loaded
- B = Offset to bypass program (letter) variables.  
A(B + 1) is the first data item. (On Casio, delete B throughout or set B = 0.)
- C = Number of data items in use
- D = Number of periods to average when adding data
- E = Index a data item in A
- F = Divisor used to compute average

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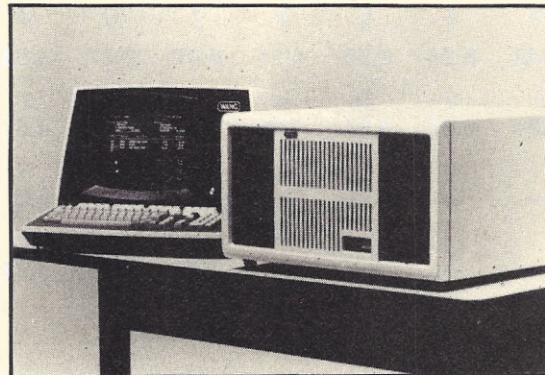
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# Wang 2200SVP



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DECstation 78	5:04.8*	\$10,495
Radio Shack TRS-80 model II	3:38.6	\$ 7,609
Apple II +	6:17.4	\$ 4,330
Digital Microsystems DSC-2	3:28.8	\$ 9,015
Ohio Scientific C3-A	15:49.3	\$10,940
Alpha Micro AM-1011	3:25.3	\$15,605
Data General CS/10 model C1	**	\$13,400

Altos ACS8000-15

SD Systems SD-200

NEC Astra 205

IBM 5120

*to be covered in future issues*

\*Result includes both compile and run time.

\*\*Time of 2:40.3 was obtained using hard disk system.

by Hillel Segal

With this issue, we begin looking at another group of 12 computers that have been benchmark-tested for the Association of Computer Users. Included in the group are a number of new systems, not available at the time the earlier tests were done. All are tested

with the same programs used previously, so the times are still comparable.

In the new group of computers, we are reporting on models priced as high as \$25,000 for a complete system. Some have multi-user capabilities, but all are being tested here for single-user performance.

The Benchmark Reports are written to provide as much information as possible on each system in a standardized form that makes it easy to compare

between different makes and models. They include the results of a variety of benchmark tests, covering processor speed, disk storage speed and performance in real-life programs.

We can't possibly provide all the detail of the full reports within a monthly article, so we have selected a single benchmark test for comparison. The one chosen is the accounts receivable problem, which simulates an actual accounting function. It uses a mixture of processor and disk operations to give an idea of the system's general speed.

The scorebox indicates the results of this test for 12 systems that were in the ACU Series 1 Benchmark Reports (IA Jan 81 through Mar 82).

The 2200SDVP is the third system by Wang Laboratories, Lowell, MA, that we've tested during the various benchmark series. Others were the 2200VP, tested in Series 2, and the 2200MVP in Series 3. Like its family members, the lower-priced 2200SVP did well in the tests. The accounts receivable time of 2 minutes, 23 seconds is among the fastest we've seen for a system tested using floppy disk storage.

Some systems in this price range now offer hard disk storage, but for better comparability, we are reporting the floppy disk-based times in the scorebox. Hard disk times, where applicable, are available in the full reports. The Wang 2200SVP, when tested with its 2 million character hard disk, ran the test in 29.1 seconds.

The system as tested included a CRT and keyboard, a separate unit with processor, 32,000 characters of memory, a 1-million character floppy, and a 2-million character hard disk; a dot-matrix printer that works at 125 cps; and the Basic-2 language. The total price was \$14,600. Wang also offers leasing and rental plans.

The basic unit comes with 32,000-character memory, and this was sufficient for the tests. The operating system and Basic language reside in a separate control memory. In addition, the system uses space compression techniques and allows parameter passing between programs, easing memory restrictions.

### Top capacity doubled

Expansion to 64K was available at the time the tests were run, but Wang has since announced a group of improvements for the entire 2200 series. Among these are a new top capacity of 128K, plus an optional 8-million character Winchester hard disk drive.

The CRT terminal supplied with the system, model 2236DE, offers user-programmable function keys and an alternate character set for simple graphics. The screen has highlighting, blinking and reverse video (black on white). Brightness and contrast controls are also included. The keyboard has a crisp, typewriter-like feel, which users said they liked very much.

At the time the system was tested, it was available only in a single-user version. Now, perhaps the most significant enhancement is that up to 16 tasks can be going on in the 2200SVP at once. These can be used either by a single user or by multiple users at remote terminals. The new feature, called multiprocessing, can be added to existing systems.

Cobol has been added to Basic for this system, allowing more of the existing business software written in that language to be adapted for use. All benchmark testing was done in Basic, however.

The interactive Basic makes the operating system transparent to the user, although there are some system commands, such as CLEAR, HALT and RUN. The language provides a number of advanced features, such as MAT operations, PRINT USING, matrix operations for certain math problems and extensive error trapping. Debugging is assisted with a trace mode, single stepping and a cross-reference listing of program variables.

Our benchmark consultants noted that the file-handling capabilities are a bit awkward to use. For example, a modified program cannot be easily saved under its old name; to do this, one must first scratch the old program and its associated data files.

The program editor uses special editing keys and has other features for convenience, but is of conventional line-oriented nature, rather than taking more advantage of the screen.

### Vendors supply most software

Wang has announced several new software aids, but the company leaves much programming to outside sources. The Wang packages include business accounting software, word processing and a software development tool called Ideas. Newly released is Datamerge, said to be the first module in a data management utility called Prism.

Most software for business users will come from vendors who develop applications programs and market complete, turnkey systems. Wang has a long list of approved vendors who offer business and engineering software along with Wang hardware.

For the user-survey portion of the report, our consultants (the University of Colorado Business Research Division) contacted eleven users of the system, using names supplied by the manufacturer. Most of the users had third-party software, but nearly half were also programming in-house. Only one had the Wang general business systems and word processing packages; this user thought they were both "great," and were largely self-explanatory.

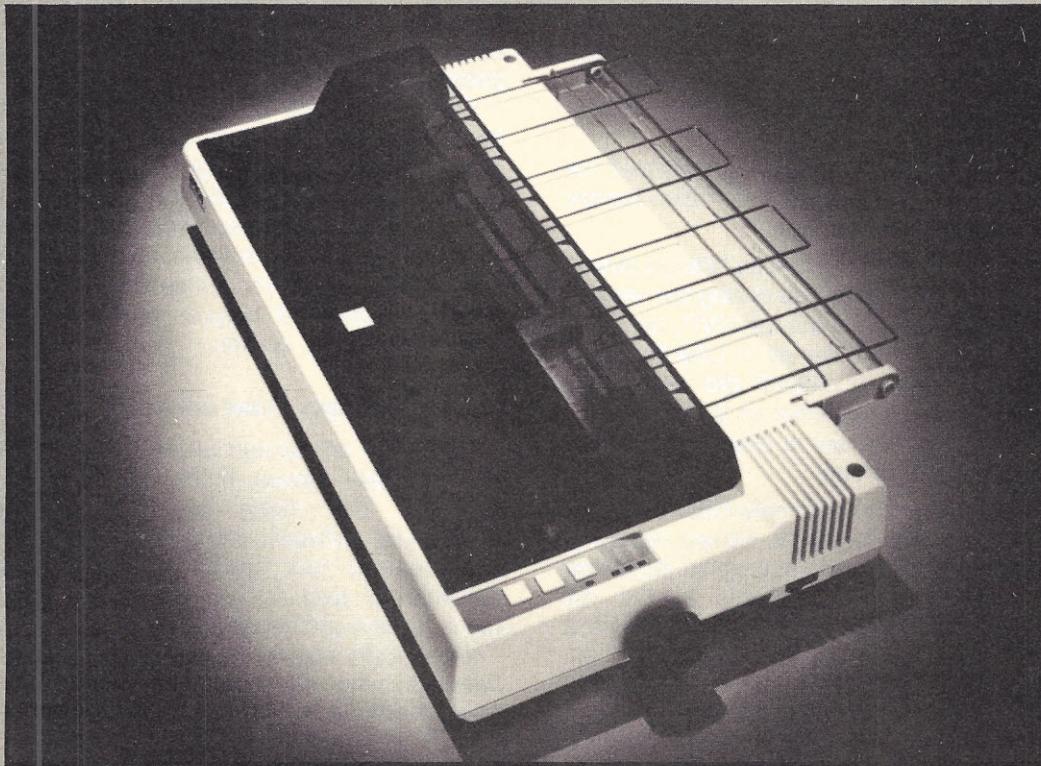
When customers listed their reasons for choosing this system, they mentioned ease of programming, speed, available third-party software, and power. The hardware was given good marks for dependability, while service was rated "fine" to "excellent."

Service is provided by Wang's customer service representatives. A standard 90-day warranty is included with purchase, and a priority maintenance contract is available at a cost of \$68 to \$137 per month, depending on the size of the configuration.

At the time the system was tested, it seemed its only serious limitation was the single-user limit. Now, with the announcement of multiprocessing and bigger storage capacity, the system has improved expandability. If both data and word processing are desired in a single system, the unit is especially worthy of consideration.

*Hillel Segal is president of the Association of Computer Users, a non-profit association with members all over the U.S., Canada and several other foreign countries. A complete package of information about membership is available from ACU, P.O. Box 9003, Boulder, CO 80301. □*

# Epson MX-100 Printer



## Full-sized and Full-featured

by Roger H. Edelson

The recent addition to the already fine line of printers from Epson (Torrance, CA), the MX-100, is not better solely because of its increased size, though that is certainly a major advantage. The unit combines all the best features previously scattered throughout the Epson line—the choice of either friction feed or fully adjustable tractors, the throwaway print head, bit image graphics, plus some simple (but very welcome) enhancements, and the 15-in. wide paper capability.

The MX-100 maintains the same low profile and two-tone styling characterizing the Epson line. The printer features a slightly raised smoke-colored printer lid (to incorporate the combined tractor/friction feed mechanism), and a redesigned paper separator and guide mechanism. The tractor feed mechanism (the sprocket unit) may be removed should it become an obstacle when using single sheets with the friction feed. This operation takes less than a minute, and the only difficulty encountered was trying to decide where to place the removed unit; replacement is just as easy. Manual paper movement is facilitated by a large knob on the right side that provides comfortable control of the paper position when manually advancing the paper, or aligning the top-of-form position. The control panel containing the paper advance controls (line feed—LF, and form feed—FF), the various indicators, and the ON LINE/OFF LINE control is placed very conveniently just above the paper advance knob.

One simple, but very welcome, touch in the mechanical design is the placement of the heads of the screws that secure the upper case to the lower half of the printer. These are placed in recesses in the upper case, so that they are available from the top of the unit. In the other Epson printers, these screws are accessed from the printer base, which requires turning the unit upside down before beginning to separate the case. In the earlier models, after the screws were loosened, the printer had to be righted to remove the upper case. This usually resulted in at least two screws falling from the unit base and getting lost. With the MX-100, the entire operation is performed without having to flip the printer. Also, let's have a moment of praise for the unsung genius in the mechanical design department of Epson who thoughtfully provided a full cutout for the manual paper control shaft; now it is possible to remove the upper case with a simple lifting operation, instead of maneuvering it as if you were trying to solve a Chinese puzzle.

The printer incorporates the throwaway type of print head assembly pioneered in the MX-80 and other Epson printers. This highly reliable device (it has a life expectancy of approximately 100 million characters) provides a 9 by 9 character matrix, which can serve both data-processing and correspondence requirements. As a matter of fact, all the reliability numbers for this printer are expressed in millions—the black ribbon cartridge is good for at least 2 million characters, and the entire printer (excluding the print head) has a MCBF (mean character between failure) rate exceeding

5 million lines. When in the 9 by 9 mode, the unit will print at 80 characters per second using bidirectional, and quickest path selection logic. In this mode, the print is quite readable with a full 96 ASCII character set incorporating lower case descenders, plus eight international character sets, selectable either through DIP switch settings or under software control. The print head is easily replaced, requiring only about 5 to 10 minutes, and the replacement is available for less than \$40.

The print head is capable of producing one original plus two carbon copies, which should be sufficient in this era of readily available reproduction machines, though there may be some difficulty when using multi-part forms. The paper feed is from the rear, and also exits in the same direction. In my implementation, it is necessary to bring the printed output back over the top of the unit, and let it fall down the front to keep it from interfering with the paper supply. A reed switch is

provided to indicate when a paper-out condition is imminent, but the wizards at Epson also provided a DIP switch option, which allows the paper-out command to be disabled. This is particularly nice when using single sheet paper, as it allows printing to the bottom of the page.

To meet the requirements of correspondence quality printing, the user may select emphasized or double-emphasized print variations in either normal or enlarged sizes. Additionally, it is possible to select a condensed print size, allowing a maximum of 233 characters per line, when using full width paper. One can even mix the condensed and enlarged modes to give an 8.25 character-per-inch size, which provides a nice tradeoff between the 10 CPI standard and the 16.5 CPI condensed print. In this mode, it is possible to print 116 characters per 15-in. line, and approximately 70 characters on a single line of standard 8.5-in. paper.

Five of the many possible variations in print characters are shown in figure 1; these variations are obtainable

#### 10 CPI Standard

ABCDEFGHIJKLMNPQRSTUVWXYZ  
abcdefghijklmnopqrstuvwxyz  
12345678901234567890!#\$%&' ()\*=+<>?!#\$%&' ()\*=+<>?  
EPSON MAKES MORE PRINT MECHANISMS THAN ANYONE ELSE IN THE WORLD.  
Epson makes more print mechanisms than anyone else in the world.

#### 10 CPI Emphasized

ABCDEFGHIJKLMNPQRSTUVWXYZ  
abcdefghijklmnopqrstuvwxyz  
12345678901234567890!#\$%&' ()\*=+<>?!#\$%&' ()\*=+<>?  
EPSON MAKES MORE PRINT MECHANISMS THAN ANYONE ELSE IN THE WORLD.  
Epson makes more print mechanisms than anyone else in the world.

#### 5 CPI Double Emphasized

ABCDEFGHIJKLMNPQRSTUVWXYZ  
abcdefghijklmnopqrstuvwxyz  
1234567890:-!#\$%&' ()\*=+<>?  
EPSON MAKES MORE PRINT MECHANISMS  
Epson makes more print mechanisms

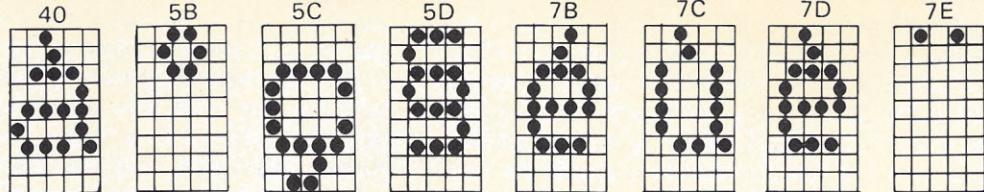
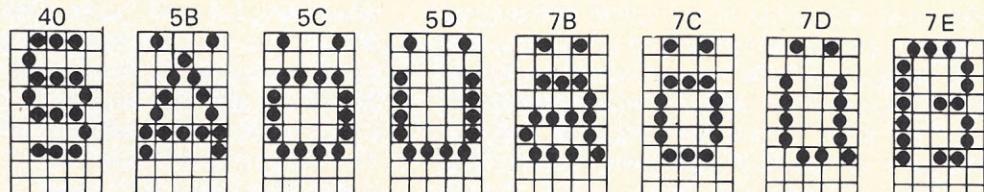
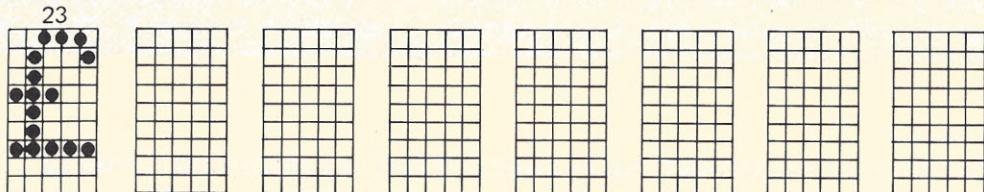
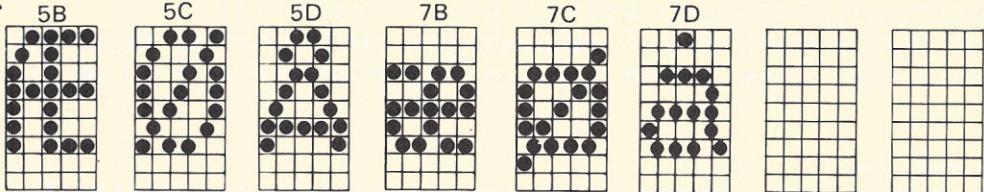
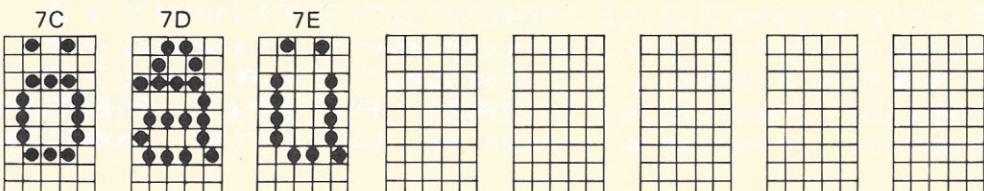
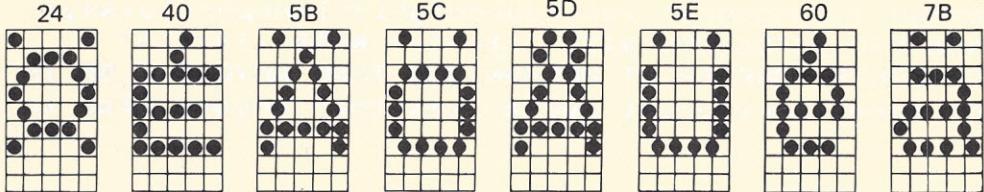
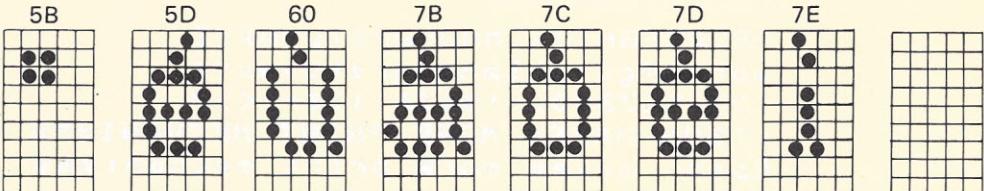
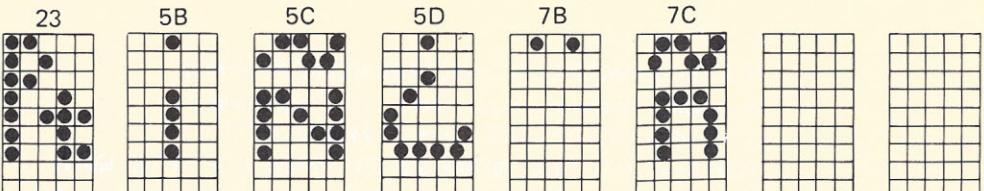
#### 8.25 CPI Double Emphasized

ABCDEFGHIJKLMNPQRSTUVWXYZ  
abcdefghijklmnopqrstuvwxyz  
1234567890:-!#\$%&' ()\*=+<>?  
EPSON MAKES MORE PRINT MECHANISMS  
Epson makes more print mechanisms

#### 16.5 CPI Standard

ABCDEFGHIJKLMNPQRSTUVWXYZ  
abcdefghijklmnopqrstuvwxyz  
12345678901234567890!#\$%&' ()\*=+<>?!#\$%&' ()\*=+<>?  
EPSON MAKES MORE PRINT MECHANISMS THAN ANYONE ELSE IN THE WORLD.  
Epson makes more print mechanisms than anyone else in the world.

Figure 1. Sample print formations

**FRANCE****GERMANY****ENGLAND****DENMARK****SWEDEN****ITALY****SPAIN**

**Figure 2. International character sets**

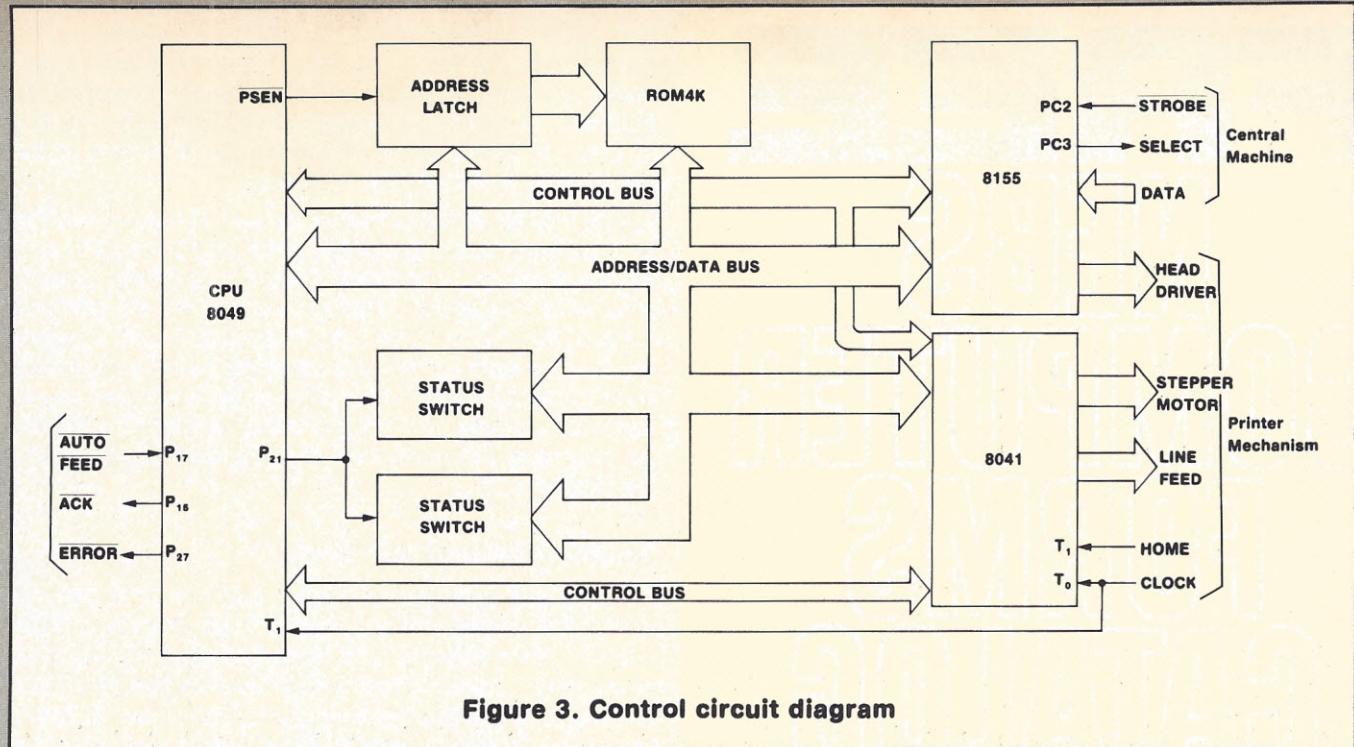


Figure 3. Control circuit diagram

through software control, and all the different character sizes may also be selected by appropriate settings of the printer DIP switches. The seven additional international character sets are illustrated in figure 2. Unfortunately, the only print style not carried over from the Graftrax option in the MX-80 line was the italic set. Maybe the company will offer this set later, when 32K PROMs are lower in cost. Additionally, it is possible to use a double strike command with any of the character modes to provide additional print highlighting when special emphasis is desired.

Besides providing superior quality text printing for both general usage and correspondence applications, the printer also possesses a Bit-Image printing mode for graphic data processing. In this mode, the printer has a dual capability, with a normal density mode of 816 horizontal dots-per-line, and 1,632 dots-per-line in the dual density mode. This horizontal resolution, coupled with the vertical resolution inherent in the nine-wire print head, allows precise placement of up to 10,368 dots in a square inch, making it possible to print accurate circles and even simulate pictorial brightness variations.

To convert the printer's operation from the Text mode to Normal-density Bit-Image mode, the host computer must transmit the "ESC K + n1 + n2" code. In this code, the n1 and n2 values are the two-digit hexa-

decimal numbers that define the amount of bit image data to be transmitted; the "+" symbols are shown only for legibility and should not really be transmitted. (Actually, the printer operates on the binary values of these four bytes.) The eight bits represented by n1 make up the low order byte of the two-byte word, setting the number of dot positions to be reserved for graphics for the line being printed from the point on the line that the control code "ESC K" was transmitted. As no more than 816 dot positions may be printed per line in the normal density mode, any number greater than this value is ignored, and the printing of bit image data after the 816th dot position cannot be guaranteed. When printing graphics in the Bit-Image mode, it is necessary to re-establish the mode for each line printed.

To achieve all these features, the unit relies on a single chip microprocessor, the 8049, in conjunction with three 16K EPROM and LSI interface chips, as shown in the block diagram of the control circuitry (figure 3). The use of a microprocessor allows the printer to logically determine the shortest printing path when in the bidirectional mode to increase the printer throughput. The internal computer also provides programmable line-feed length (1/72 in. to 85/72 in.), programmable form feed (to 127 lines), horizontal tab (to 12 positions), and eight positions of vertical tab.

```

( ) *+, - . / 0123456789 : ; < = > ? @ ABCDEF GHIJKLMNOPQRSTUVWXYZ
) *+, - . / 0123456789 : ; < = > ? @ ABCDEF GHIJKLMNOPQRSTUVWXYZ
*+, - . / 0123456789 : ; < = > ? @ ABCDEF GHIJKLMNOPQRSTUVWXYZ
+, - . / 0123456789 : ; < = > ? @ ABCDEF GHIJKLMNOPQRSTUVWXYZ
, - . / 0123456789 : ; < = > ? @ ABCDEF GHIJKLMNOPQRSTUVWXYZ

```

Figure 4. Self-test printout

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The printer also has programmable skip-over perforation, which is selectable by DIP switch setting or controllable by the software of the host computer. While a Centronics style 8-bit parallel interface is standard, an optional RS-232 serial port may be added, or one can even configure the printer interface to be compatible with the IEEE 488 bus.

The interior of the printer is neatly laid out, consisting of the single board controller, containing the CPU and all the ancillary integrated circuits, a power supply area, and a small fan. The MX-70 and MX-80 printers (IA Jan. 82) did not have fans. Presumably with a longer continuous print length, the company found it advisable to add one to the MX-100. The single controller board provides a socket for adding optional adapters should an interface different than the standard parallel port be required.

## Simple setup and operation

Setup and operation of the MX-100 are unsurpassed in simplicity. All that is required is to unpack the printer and its related parts and spend about 15 minutes in assembly. The only tools required are a pair of screwdrivers, one phillips-head and one flat-blade, at least according to the manual. (I have yet to find a screw requiring a flat blade screw driver.) The screwdrivers are used to remove the shipping screws and the screws that secure the upper half of the case. This latter step is needed to allow access to the DIP switches for setting the functions and characteristics of the printer operation. After these switches have been set to the desired states, it is possible to check the printer operation by activating the self-test function. To do this, one turns on the printer power while depressing the LF (line feed) button. The self-diagnostic function will check the print head operation and print quality, as well as the operation of the printer mechanisms. All characters provided by the internal software (as selected by the DIP switches) are printed out in barber-pole fashion (figure 4). If the serial RS-232 interface is in place, its operation may be checked through the use of the self-test button provided.

After it is been established that the printer is functioning correctly and the interface is operating normally, all that remains is to connect the MX-100 to the computer and start printing. To set the top-of-form position when positioning the paper, turn the printer off, position the paper, then turn it back on again. This operation initializes the printer functions, and can also be done by applying the INIT\* signal to the parallel interface. I wish the designers had added a control to accomplish this function, so that it didn't become necessary to cycle power whenever repositioning the paper; I don't think it enhances the reliability of any electronic device to continually subject it to power transients. Sometime in the near future, I plan to modify my MX-100 to add this function. Also, it would be nice if it wasn't necessary to take the printer off-line to activate the form feed control. In this case, there is no question of damage or stress to the printer. But it is somewhat annoying when printing out consecutive files with each file to be started at the top of the sheet.

With a full-sized carriage, user-friendly operation and a list price of under \$1,000, the MX-100 is an exceptional value among dot matrix printers. □

# An open letter to the readers of Interface Age

Hillel Segal, President, Association of Computer Users

My purpose in writing is to tell you that my colleagues and I have decided to launch a program that could dramatically help you manage your computer resources. It will be called *Computer Assistance Teams or CATS* for short.

Ever since the Association of Computer Users was formed in 1974, I have been thinking and dreaming about the possibility of starting a program that, quite literally, would allow each member to directly benefit from the experiences of other users. By setting up teams of users around the country, members would be able to draw upon the knowledge and skills of the other team members when looking for software, checking hardware reliability or handling the many problems that users face regularly.

This has never been done before. Usually, each user is on his own—continually reinventing the wheel. This is the traditional way most computer users operate; not that they want to, but simply because they have no other choice. Up until now, a program hasn't existed that easily allowed users to seek and receive advice from other users. ACU is now starting such a program, and we need team members from every city, town, and hamlet in the United States and Canada to make it a success.

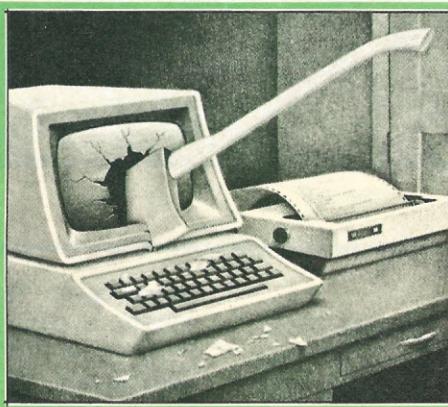
My hope, therefore, is that we can find enough readers, in addition to our current members, to make this plan feasible. You can participate by becoming a member of the Association of Computer Users. At the same time, you would also receive all of the other benefits of ACU membership.

What about the Association itself?

We believe that ACU has several unique functions in the computer industry. First of all, as a non-profit user organization with elected officers, our primary obligation is to represent and serve computer users and prospective users. (Those involved in the sale of computer products or services are welcome to join too, but they are not

permitted to vote or hold office.)

Secondly, our monthly journal *Interactive Computing*, our BENCHMARK REPORTS that review computer systems, and all of our other publications are geared to (1) provide practical "how-to" advice on the selection of hardware and software, and (2) use it productively. What makes ACU special is its unique user-point-of-view.



For example, not long ago we displayed the drawing shown here on the front cover of *Interactive Computing*, along with an article entitled "Ten Pitfalls To Avoid In Buying A Small Computer." The entire issue demonstrated our independent tell-it-like-it-is attitude. Users loved it, and many vendors even ordered reprints.

In addition, many readers of *Interface Age* have followed my regular column in these pages during the last year, so you may already be familiar with ACU's activities.

I think enough has been said to indicate that the new CATS program will direct its central energies to both the users' current needs and future problems.

But it would be a mistake, I think, to attempt a full description of the program. Programs like these are not really invented or created. They evolve. They are the product of creative interaction between the special needs and enthusiasms and concerns of those involved.

In this way, ACU serves as a catalyst, and our publications and programs take shape issue by issue and year by year. No single issue of our journal (which carries no advertising), can really be expected to tell a reader everything he may want to know about a particular subject. Similarly, since it might be misleading to try to tell you exactly how the CATS program will work, what I have tried to do is to tell you something about our philosophy and approach—and to seek your participation to make it a success.

Some specifics: Membership in ACU costs \$65 per year—which is not a lot compared to other information sources that provide real value. Included with your membership is a binder and all back issues of our journal still in print.

We ask for no money now. That can come later. What we need right now is an expression of your interest.

As I said, in inviting you to join ACU, we realize we are asking for your confidence. We have high hopes of fulfilling your expectations. The process begins with the application form below.

Sincerely,

A handwritten signature in cursive script, appearing to read "Hillel Segal".

Hillel Segal

IA.4

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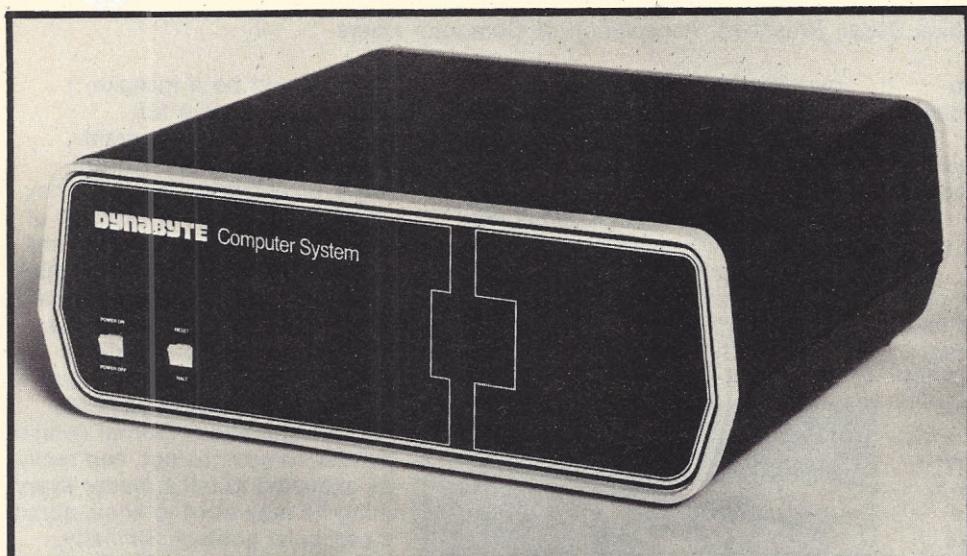
Name, Title \_\_\_\_\_

Company \_\_\_\_\_

Street \_\_\_\_\_

City, State, Zip \_\_\_\_\_

# DYNABYTE 5505



by Tom Fox

Dynabyte, (Milpitas, CA), introduced computers that were characterized by a distinctive, sculptured box clad in real (not simulated) walnut veneer, when the company opened in 1977. Now, the wood is gone, but the basic layout of Dynabyte computers has remained much the same through the years.

The systems adhere to the S-100 design specification, although not to the stricter requirements of the new IEEE-standard 696. The term "S-100 bus" describes the physical and electrical configuration of the computer circuit boards, and the way in which they interconnect with each other. In Dynabyte's case, one of the boards contains the central processor, a Z80 microprocessor-integrated circuit device. The Z80 is an 8-bit device, running in this case at a rate of 4 MHz.

Dynabyte's 5000-series business microcomputers comprise a varied family, allowing some 40 different configurations of memory, disk and peripheral devices. For our testing, we selected the 5505, because it utilizes the smallest of a new generation of mini-Winchester disk drives. This device contains a single hard disk platter measuring just 5 1/4-in. in diameter. It's sealed within a remarkably small hermetic enclosure, mounted in a cradle of soft rubber suspensors. The entire disk drive is designed to fit into the space normally occupied by a standard 5-1/4-in. minifloppy diskette drive. The drive is supplied to Dynabyte by Tandon, and carries the designation TM602.

The data capacity of this mini-Winchester is very *un-mini* indeed. A total of 6.4M bytes of information can be stored—up to 20 times as much as many comparably-sized floppy diskette drives. The formatting requirements of this unit extract some 17% of overhead, leaving just 5.32M bytes of user-accessible space.

The 5M-byte + size of the disk drive is the single characteristic of the 5505 that propels it out of the

category of traditional floppy-based business computers. Suddenly, programmers do not have to think in terms of having different diskettes for different applications, or partitioning large data bases in an illogical manner. The end user is relieved of much of the librarian task of sorting through a collection of floppies to find a misplaced application. The advance of hardware technology has allowed the encroachment of "big computer" thinking into a desktop-sized micro.

In addition to the Winchester, the 5505 contains a second built-in disk drive. This is a single-sided, double-density minifloppy diskette device, Tandon's TM100-3M. It also utilizes a 5-1/4-in. medium, and has a capacity of 315K bytes of formatted, usable data space. The main function of the floppy is to make a safety copy of the data contained on the larger hard disk, guarding against the day the Winchester device fails—or perhaps the accidental erasure of data by a careless operator. This is called "backing up" the data—an absolutely essential activity when living with a computer.

A little arithmetic reveals that a full 5.32M-byte Winchester will fill up a total of 17 315K-byte floppy diskettes. This suggests that the backup procedure might become a tedious chore—as it certainly could. To make matters worse, most users make at least two backup copies of critical data—one stored off-premise to guard against a fire or other disaster. In actual practice, it's usually only necessary to back up a portion of the large disk on a regular basis. Much of the modern programmer's thinking is applied towards making that portion as small as possible.

In the 5505, the floppy disk has at least two other important functions. One is to act as the means of transporting programs and data between this computer and other systems. When you purchase software, it usually arrives in the form of a program written on a floppy diskette. You only have to make sure that the

diskette is compatible with the format of your drive. One of the first tasks after opening the Dynabyte shipping carton is to copy the operating system software from a floppy onto the Winchester device. If all goes well, the original floppy can be stored away as a backup, since it is unlikely to be needed again.

In normal operation, the 5505 will "boot up" from the Winchester drive. This means that programs resident on the hard disk are loaded into the processor's main memory, so that the machine can begin to act like a computer. What do you do on the day the critical systems programs get accidentally erased from the Winchester? Here we come to the second important use for the floppy diskette drive. You simply insert the as-delivered system diskette, and the computer will boot up, using the programs in the floppy device. Equipped with a whole computer once again, a programmer is then able to diagnose (possibly even fix) the problem with the Winchester data.

### Specialists develop software and languages

At one time, computer manufacturers inevitably found themselves in the business of creating software operating systems and programming languages, as well as the hardware bits of the machines. These days, there is an excellent selection of systems software, and it is no mark of shame when a computer maker chooses to let the established specialists handle this aspect of the development effort. As Dynabyte computers are Z80-based, they rely heavily on Digital Research's CP/M operating system for single-user environments, and companion MP/M when multiple users are called for. In addition, the competing OASIS operating system from Phase One Systems is available in both single- and multi-user versions.

Most of the major microcomputer manufacturers have spent considerable effort in "tuning" the available operating systems to match the capabilities of their hardware. Dynabyte is certainly no exception, and maintains a permanent staff of competent software engineers to take care of this aspect alone.

CP/M, for example, has been enhanced to allow the display of a user-specified message during the boot-up process. In addition, the system can be trained to automatically wake up into an applications program, such as WordStar or a customized bookkeeping package. This allows a programmer to make all aspects of the computer operation "user friendly" with menus and other such techniques. The computer operator need have no training at all into the mysteries of PIP and ED, to mention just two traditional stumbling blocks for beginners.

DYNASYS is the name of a versatile CP/M utility that manages several aspects of the system's initial set-up. Menu-driven, this program handles the assignment of logical disk devices, formatting and creation of system and data disks and definition of the system's terminal(s) and printer(s). It is the most elaborate of a series of programming utilities intended to streamline the initial setup and operation of the computer system.

Similar attention has been lavished on the considerably more difficult task of making multi-user MP/M rest easily within Dynabyte frames. Up to eight terminals are supported simultaneously—up to 16 printers, too. A maximum of 16 logical disk devices are supported,

and there's no requirement that they all be the same size. MP/M requires 32K bytes of memory for its own operation, and allows each terminal to occupy 48K bytes of space for its exclusive use. When purchasing a multi-user computer, make sure there are enough slots in the motherboard to accommodate future memory needs as terminals are added.

MP/M is, of course, compatible with applications programs written for the single-stream CP/M environment. The manufacturer, in fact, makes the statement that *any* program that runs on one of its computers will run on any other Dynabyte of the same or larger size—assuming that the operating systems are compatible.

As we've stated, the Dynabyte staff does not see themselves as creators of major software packages. They do, however, take a lot of trouble sifting through the sea of available programs and offer what they consider to be the best of them as a part of their computer lineup. Their chosen word processor is MicroPro International's WordStar, along with the supporting programs SpellStar and MailMerge.

This manufacturer's choice in the VisiClone field of spread-sheet analyzers is Business Planner. It can handle up to 20 columns of 50 rows of financial data. Each row/column intersection can be filled with financial or other data, and the program automatically computes row and column totals as needed. A variety of arithmetic manipulations are allowed, including some rather complex formulas. Business Planner runs under CP/M or MP/M.

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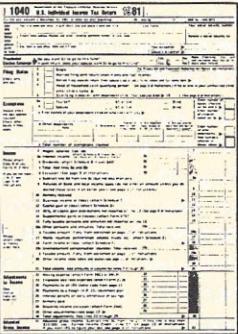
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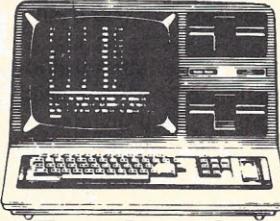


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user menus, the package includes sales order entry, accounts receivable, purchase order management and inventory, accounts payable and general ledger. Two additional modules, payroll and point-of-sale, can be integrated but are priced separately. The system is available in three versions, depending upon the capacities of the installed 5-1/4-in. disk drives. The model we tested was the 5505-A1, fitted with 5.3M bytes of usable Winchester storage, and 315K bytes of single-sided, double-density floppy storage. This carries a list price of \$6,995. The 5505-B1 contains 8.9M bytes of Winchester storage and a double-sided floppy (630K bytes), and lists for \$7,695. Finally, the 13.4M-byte 5505-C1, which contains the same double-sided diskette drive, costs \$8,495.

In addition to the disk drives, these prices include the processor, 64K bytes of RAM and three I/O ports: two serial and one parallel. Additional RAM is available at \$595 per 64K bytes. For multiple users, a 4-port serial I/O board is available for \$495; a larger 8-port version for \$795.

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All software is priced separately. Digital Research's CP/M lists for \$195 and Phase One's OASIS for \$595. Both are single-user operating systems. Multi-user MP/M and OASIS are available as well, for \$495 and \$995, respectively.

Growing into a multi-user system necessarily requires the addition of memory and additional I/O ports. To ease the shopping chore, Dynabyte offers a pre-packaged Multiuser Expansion Kit. This will cost \$1,995, and includes 192K bytes of RAM, a 4-port serial I/O board and the MP/M operating system.

Although we know that a host of programming languages and applications programs are available on all CP/M systems, Dynabyte lists a fair number in its catalog that have been certified as operational on the 5505. These include Microsoft's Basic interpreter (\$400) and compiler (\$500), the semi-compiled CBasic (\$150), Fortran-80 (\$600) and Cobol (\$995). The WordStar word processing program lists for its usual \$495, with attendant SpellStar and MailMerge at \$150 each. The multi-talented Business Planner will cost \$495, and the extensive capabilities of Business Manager can be yours for \$995—\$1,000 more if you need the multi-user version.

Other versions of the same basic computer are available. The Dynabyte 5615 is similar, but built around 8-in. Winchester and floppy disk drives. This version requires a double stacked cabinet, has disk capacities up to 36.7M bytes and will cost from \$2,000 to \$4,500 more than the 5-1/4-in. varieties.

An interesting new machine is the Dynabyte 5710, which forsakes floppy disks entirely in favor of a data-quality cartridge tape drive. If you're considering the 8.9M-byte 5505-A2, take a look at the 5710-A1. It uses the same Winchester disk drive, and contains as well a 13.4M-byte cassette tape mechanism. The convenience of backing up the entire disk onto a single tape cassette (instead of up to 17 separate floppy diskettes) seems to us good enough reason to spend the extra \$1,300. Since the cartridge idea is so new, expect some problems in acquiring outside software until the vendors start distributing their programs in compatible cartridges. □

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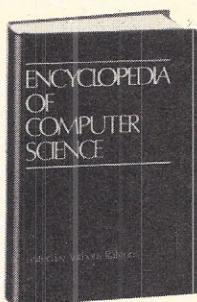
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Program listings should be no more than 60 characters wide, with no wrap-around lines. Unlined paper and a new ribbon should be used. Sample runs should also be included. In the article text, variables should be described. The system utilized in composing the program should be detailed — operating systems, language type and version, and any necessary peripherals.

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# The Retail Market Goes Computer

by Terry Benson



Photo courtesy of Pacific Coast Hardware, Long Beach, CA

Many retail managers see the business computer as too expensive and not very worthwhile for retail applications. The attitude is, perhaps, promoted in much editorial material related to the use of business computers. In general, typical ideas tend to place an emphasis on office applications. But there are just as many potential uses of a system in retail stores. The investment in such a system by retail outlets, be it point-of-sale (POS) or simply handling the books, can be quite cost-effective.

POS, accounting and inventory applications can each be incorporated into a computer to improve a store's profitability. The POS application would either interface with or replace the present cash register. Accounting packages will simplify the store manager's duties and probably provide more accurate reports. Inventory control is important to make sure that the proper items will be available when required. Real time or on-line inventory control can provide immediate updating directly from the cash register input, if that option is available. If no direct input is provided, daily entries can easily be accomplished through the console keyboard.

One of the most touted applications of the business computer is word processing, and many think that the retail business would not need such a system. But many stores make use of personalized letters to update their normal clientele with pending sales, or just to keep their customers up to date on the business progress. While it may be unlikely that daily letters are generated, it would still be cost-effective to have a word processing software package available that incorporated a mailing list merge feature, in order to rapidly correspond with all customers.

A general ledger program (or perhaps only a subset of an accounting package) could be considered for a retail application. Depending on the type of business, accounts payable and accounts receivable programs may support time payment plans for both supplier and customer. A general ledger program would almost certainly be beneficial for any retail store.

As a retail application grows or as more locations in the store become automated, additional terminals or systems can be added. For a small retail store, it may be appropriate to buy a single-user business computer, whereas larger stores may need a multiuser system. For stores with multiple locations, it may be desirable to incorporate modems, thereby allowing communication with the other stores, or even a central warehouse. This could allow immediate access to stocking or inventory information in the other locations. Through the computer terminal, order entry can be updated to minimize the delivery time of replacement items.

Perhaps one of the most valuable applications of the small business computer in a retail store is the ability to handle POS information. Many of the advantages are readily apparent for POS application, but they are usually thought to be too expensive for small retail applications. Let's take the example of a small store in a community shopping center where one cash register keeps track of all sales activities. This type of store could be a dress shop, a health food store, an auto supply store or a computer store.

In any of these applications, the part number of the item plus its price or other coded number can be stored in the computer. The label for the item can also be

printed by the computer. When a sale is made, the clerk or cashier merely enters the inventory item number, and the computer will do the rest. This can include printing a sales receipt with item description, totaling all purchases, adding the tax, and crediting the payments either by cash, check or credit card. In addition to the immediate output, the inventory stock list can be automatically updated. If a particular item ran below a minimum stock level, a day-end report could be generated to indicate which items need to be re-ordered.

In addition to the sales and stock information contained in the computer, a POS terminal could also be used to log employees on and off, keeping track of their hours, then printing a time card and/or the payroll check at week's end. It could also be used to keep track of commissions on sales for individual employees, which would help to minimize paper work, allowing each employee to be more productive.

### **Other applications are possible**

While POS applications are the ones that first come to mind when discussing the retail business, they are not the only application of a small business computer, nor is it necessary to incorporate that feature. But with the POS method, a more complete, self-standing system could be implemented. The POS hardware is frequently no more expensive than a conventional stand-alone cash register. In fact, some of the newer cash registers are easily adaptable to a computer interface.

Let's see how the business computer fits into the retail operation. First of all, you would expect that normal business procedures would take place—but the retailer has additional problems. These problems can easily be handled in a large department store with several outlets because the off-site computer is necessarily large with a complete data processing staff to program and operate it. In the newer systems, all the cash registers interface to the computer and can verify customer credit, update inventory, and apply proper commissions to each salesperson.

This is not so in a small retail store—the "mom-and-pop" type of market. There are a few outlets at most. The entire staff may be sales people—no data processing or accounting departments. Maybe there is nothing besides the showroom and a small office in the rear to do the books, and the owner/manager probably ends up bookkeeping at all hours of the night.

Besides the accounting tasks, there is a myriad of paperwork associated with ordering merchandise and keeping track of inventory. Purchase orders and sales slips need to be reviewed and the sales transactions tallied. When enough sales of one item have been recorded, it's probably time to order some more—but is it? If a new model has just arrived and is selling quickly, it may be time to order some more. Maybe an out-of-fashion item should be dropped. How do you keep track? With all these forms, the manager may handle more paperwork than product.

Computers can help balance those time consuming books, simplify the tons of paperwork, and manage that income-producing inventory. Just buying one of the new personal computers, however, won't necessarily solve these problems. There has to be companion software to support the applications peculiar to the retail business—and that's part of the dilemma. There aren't many software packages devoted to the retailer but,

fortunately, many of the off-the-shelf accounting packages could well apply. General ledger, accounts payable, accounts receivable, and payroll should be fairly standard. Let's start with the POS support.

One of the few software packages designed to operate on a business computer and capable of handling the POS end of the business is CashMaster. About two years ago, Versa Computing (Newbury Park, CA) introduced this computer-based cash register software to operate on the Apple II computer. With many of the computer stores, like Rainbow Computing (Northridge, CA) using CashMaster, more Apple II users are becoming aware of its existence.

### Minimum system is required

CashMaster (\$250) requires no more than what is usually considered a minimum Apple II system. An Apple II with 48K of memory, two disk drives, a TV monitor, and a 40-column printer are all that are required to not only replace a cash register, but also provide automated accounting capabilities. Additional hardware can be added to increase storage or provide time recording on transactions. Output control for a cash drawer is also provided.

Since CashMaster is a fully interactive software package, it provides a convenient human interface and simplified training of clerks. Information entered into the system during a sales transaction is continually displayed on the screen, thereby allowing convenient corrections prior to printing a customer's receipt. Item information is entered by part number, so the clerk will not have to enter the price of each item. Tax computation is, naturally, handled automatically and is continually computed during each phase of this transaction. A running subtotal is displayed and the balance is displayed during receipt of payment, after each partial receipt, if handled by multiple forms of payment. For cash payments, the customer's change is displayed. At the completion of the transaction, a customer receipt containing all transaction information will be printed.

The cash register operation is, perhaps, the major part of the system, but the daily closeout processing is just as important—and convenient. All of the daily reports that the store management needs are available with no more than a request from the operator. Each transaction of the day, fully detailed, along with the store summaries, can be provided.

Of course, the store management can also access the internal definitions such as item number, description, and price along with the establishment message that is printed on the receipt. All commands are menu-driven, giving the manager a choice of functions. The operation is interactive; that is, the computer prompts the manager, in English, what operations to perform and what disks to insert.

The only restrictions placed on the system are a limit of 1,000 items in the price list file and a maximum of 100 transactions of 15 items each for every transaction file. Both of these restrictions are easy to overcome. The price list can contain the most frequently purchased 1,000 items and the system will request the clerk to enter the price for those items not included. If disk space runs out because of too many transactions, the cash register can be closed out for each shift or smaller work period. Versa Computing can even customize the software for special circumstances.

For those business managers who wish to generate special application software, the CashMaster data formats are fully described. These features allow a programmer to write or adapt an accounting program that uses the data generated by CashMaster.

Now we get to the back-room applications, where all of the POS information is compiled. Although CashMaster itself does generate daily closeout reports, it does not support any general ledger activity. However, the output files from the system are compatible with a comprehensive series of accounting programs from BPI Systems (Austin, TX).

This company offers a complete business accounting system including general ledger, accounts receivable, inventory control and payroll. Each is available separately, but all systems can be fully integrated for a more complete financial reporting structure. The programs offered are suitable for retail applications, such as grocery stores, camera stores or other small retail businesses.

The company has incorporated generally accepted principles of accounting into each package. All systems have been thoroughly field-tested under actual operating conditions, and the company claims that the complete general ledger accounting system has been installed in many businesses in less than three hours. This is partly due to the well-written owner's manuals, which require no prior knowledge of computers, although they are written entirely in the language of business and accounting.

The general ledger accounting system is designed to reduce the difficult task of accounting and financial statement preparation. The system is designed to minimize operator entry and will alert the operator to data entry errors. The posting of ledgers, preparation of financial statements, and closing the books are all performed automatically. Training in the use of this package is enhanced by a demonstration disk that is furnished with the package.

### Statements can be customized

General entries are handled by one program disk, which supports the entry of all data to the books. A separate disk is used to post and print all ledgers, including preparation of the balance sheet, the profit and loss statement and the general ledger. One of the features of the report generation portion of the program is that statements can be customized to suit individual businesses. The headers and account names can be modified as required, and certain sections can even be eliminated if they do not apply to the particular business.

Other ledgers available in the general accounting system are the accounts receivable ledger, accounts payable, payroll, cash distribution journal, the invoice register, cash sales journal and the general journal. Each supplementary ledger is prepared automatically, and will always be in balance with the general ledger controlling account. If the more comprehensive accounting packages are purchased, some of the ledgers would be eliminated from the general ledger accounting system.

The accounts receivable system will interface automatically with the general ledger accounting system and supercedes the accounts receivable ledger in that package. It also interfaces automatically with the inventory system, or it may be operated on a stand-alone basis. One data disk can contain all customer accounts, or for larger businesses, accounts can be spread over any number of disks providing for unlimited

capacity. The user has the option of specifying balance forward or open-item account detailing, each of which is explained fully in the owner's manual. The system automatically produces a detailed accounts receivable ledger, with an optional description of each invoice. Customer statements can be printed on customized forms, or the system will automatically print your company name and address. The accounts receivable system also provides an alphabetical listing of all accounts, cross-indexed to their account numbers, and will even generate a list of accounts by category. The system keeps track of past due accounts and will generate past due notices.

#### **Identical commands are used**

The inventory control system automatically interfaces with both the general ledger and accounts receivable systems and, in fact, has many identical commands to the other two systems to simplify the learning process. The user has the option of specifying the method of price inventory, then creating an account for each inventory item. Information on individual items can be edited at any time to update such things as minimum stock quantity or list price. The system allows the user to write purchase orders, and either print them on blank paper or on customized business forms. As merchandise is received into inventory, individual price labels can be printed. Listing of inventory items can be provided at any time, either on the printer or simply at the operator's screen for review.

The BPI payroll system, although designed to operate stand-alone, can also be merged with the general ledger accounting system. It provides compensation for salaried employees, hourly employees, and commissioned employees with a choice of commission plans. The payroll system can automatically print payroll checks, and will even prepare year-end reports, including W-2 forms. Up to nine deductions for each employee can be computed, and tax tables for the standard income taxes are built into the system. A payroll register with detailed employee payroll information for each pay period can be generated, including the payroll summary totals, gross pay, and deductions by general ledger account numbers. Other reports include earnings records, either month-, quarter-, or year-to-date, and a tax information report for the federal and state tax returns. The user can easily process even multi-state payrolls.

All BPI Systems packages are available for the Apple II computer. Some of the accounting systems have even been adapted for both the Commodore business computer and the new NEC small business computer. A recently introduced version of the general ledger system for use with the IBM personal computer now includes the capability to print checks. Each of the four business accounting systems discussed above sells for \$395. A job costing system suitable for the building industry is also offered at \$595.

While many of the users of the TRS-80 model III from Radio Shack (Ft. Worth, TX) have to locate their own software, one company has integrated software to support the POS retail application, with a cash drawer that interfaces directly to the model III. ICR Futuresoft (Orange Park, FL) has a complete hardware and software package to provide the user with a self standing POS terminal. The model CR-180 provides the cash drawer

hardware (\$449), along with the support software (\$500). The hardware includes an audible tone for data entry verification. The software package provides both POS and inventory control support. Communication with the cash register is provided through an RS-232 interface. Since no modifications are made to the model III, full Radio Shack service is supported.

The software operates under TRSDOS, and thus will simplify the user's system integration. In order to minimize user training, a master program menu displays the various functions available with the CR-180 software. All functions, from sales transactions to report printing, are self-prompting and error checking is performed as transactions progress.

In addition to the usual inventory functions, the system can print price labels and keep separate accounting for each type of sales transaction. A security code entry system prevents unauthorized cash register operation, and some functions are only available to the manager. One function allows the manager to modify the receipt message in order to customize the output. Each transaction is output to an optional receipt printer (\$425), but any printer will work with the system.

Assembling the right computer system and integrating suitable software for a retail application can be quite frustrating. There are a lot of business people willing to take the time to look around for the system, invest the necessary money and time, and learn how to use a business computer for any application. But for those who prefer someone else to do all of the work, there are some alternatives.

In particular, Lazor Systems (Sunnyvale, CA) has integrated a complete business computer system for retail applications. The system, The Retailer, is based on the company's well-established Lazor 5 and Lazor 30 models (IA Jun 80 and Nov 81). Not only has the company configured the hardware to support a small retail store, but also a comprehensive set of software has been integrated into the system to provide a complete turnkey application. The company even includes a cash register with the system so the entire point-of-sale-to-financial-report path is covered.

#### **Many line items supported**

The system is available in a floppy disk-based unit supporting up to 3,500 line items. A completely-configured system including processor, operator terminal, printer, cash register and two floppy drives sells for \$21,925. If you want to go all the way and end up with a 50,000 line item capacity, a 20M-byte Winchester hard disk (\$6,675) can be added. The small incremental cost seems to be well worth the increased capacity and higher throughput provided by the hard disk, since more users are opting for it.

One user of the Retailer started out with a floppy disk-based system in September, 1981 but decided to change to the hard disk, and add a faster printer to improve the system throughput. During this company's start-up phase, Lazor Systems worked closely with the store owners to accommodate their requirements. The customers indicate that they "have had, and continue to have, exceptional assistance from the staff at Lazor Systems." One of the primary points to evaluate when deciding on a system is whether it will handle your job in the manner you expect. For this reason, you should

work closely with the vendor, in order to have as many questions as possible answered prior to purchase.

The Retailer offers a complete software package that will automatically collect the data from cash register activity, and provide complete daily sales reports and inventory information at the end of each day. Simple operation requests will allow the user to print various reports as required. The register activity report shows the sales activity within the store by each cash register. The cost of sales report shows month- and year-to-date unit sales and cost of sales, plus gross margin by item and total. An inventory evaluation and gross margin report shows items on hand, on order, and backordered. It also summarizes each by units and dollars. The overstock-understock report shows items that are overstocked and those items that should be restocked, based on actual sales history. The on-order report shows which items are on order, how many, from whom and when due. In addition to the multitude of reports to assist the store manager, improved inventory control, purchasing and accounts receivable applications are also supported.

Along with the inventory and accounting assistance, the system will also increase the sales clerk's efficiency by providing item pricing either by request or automatically. It can also be used to indicate to the clerk whether the item is in inventory and where it is physically located. It can even verify customer accounts, account balance and limits, plus many other features selectable by the store manager.

The Retailer can support up to eight programmable cash registers through its central processor unit. One operator terminal display is available for the store

manager to interface with the system, and provides up-to-the-minute reports without requiring printed information. It is through this operator terminal that the store inventory is entered into the system. As new items are received, they can easily be added into the inventory list. The normal day-to-day sales and other dynamic data are usually entered through the cash register.

The system is easy to operate and is completely pre-programmed. It can generate numerous manager reports automatically, as selected by the user through a menu displayed on the operator terminal.

To provide security for the system, a user is required to enter a personal identification number, or password, to prevent unauthorized access to the cash registers and the system display. At the start of each day, each salesperson must identify himself by code number to gain access to a cash register. Normal training for any of the sales clerks usually requires less than one hour.

**Integrates POS with data processing**

The major advantage of a system such as the Retailer, which integrates both the POS and data processing activities into one system, is that costly re-entry of data is not required for the accounting and inventory applications. The software packages provided with the system accommodate data entry from the register and automatically update all of the information required for the generation of the daily, monthly, and yearly reports. In addition, extensive error checking and data validation are included, in order to prevent the time-consuming and costly errors that can sometimes creep into the system, and that are frequently not found until it is too late.

In order to illustrate some of the concepts mentioned above, let's review some actual retail applications of small business computers. The first example shows how a person with no prior computer experience can effectively apply a computer to a small store.

Operating two stores for a number of years from the heart of the San Fernando Valley, the Valley Book and Bible Stores (Van Nuys, CA) have only recently decided to automate some of the accounting and inventory applications. The owners decided a little over a year ago that the volume of business was surpassing what could be easily handled through the normal manual methods. After investigating a number of alternatives, Dave Wilke, Vice President and Business Manager, decided that the best support for his application would be provided by Radio Shack TRS-80 model II desk top computer. The system includes a dot matrix line printer and a recently added second disk drive.

In addition to the hardware, several software packages were purchased from Radio Shack to support the bookstore application. Wilke soon found that few of the off-the-shelf programs would directly support his bookstore application. Since he had no previous computer experience, he was somewhat hesitant to tackle the task of adapting the programs for his particular requirements, but after attending a number of what he terms "excellent classes" from Radio Shack, he felt qualified to not only modify some of the existing programs, but also generate some of his own. His first encounter was an accounts receivable program that had several bugs. With his new found confidence in program support, he overcame the majority of the problems and is effectively using the accounts receivable program. Fewer problems were

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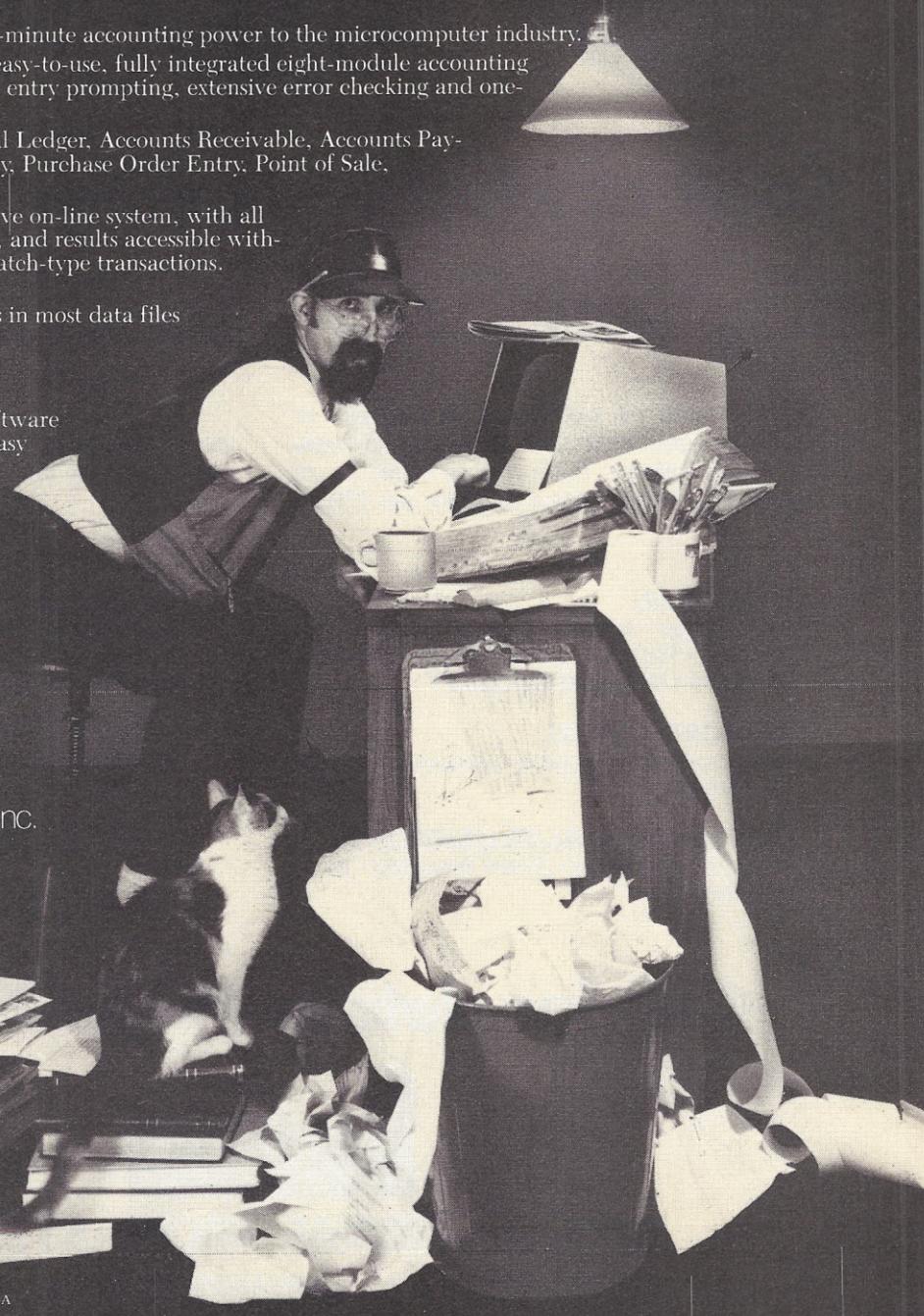
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encountered with the accounts payable package, which "worked beautifully" in his application and is used to take the cash discounts available and sends up to 120 checks per month. Another program that has been very helpful is the Mailing List II program which, again, Wilke has modified for his application. Among other things, it is used to generate bulk rate mailing labels, but since no individual correspondence is generated, the bookstore has no word processing capability in its system.

An inventory control system has recently been incorporated for both store locations and it, too, has been customized with several new modules including a machine language sort. The inventory control system evaluates all of the 2,000 items on inventory and prints the most active 100 items. Since there is no POS application in this system, all inventory is handled through data entry at the operator terminal. When a new line is received, it is assigned a stock number which, along with information from the purchase order, is entered into the inventory program. The system then prints inventory tags, which include stock number, price, description, purchase order number, date, vendor and product type. The tags are attached to the item, then torn off when sold. All of the tags are saved up for the computer operator, who enters information from each tag into the inventory program once a week. The tags are mailed from the second store to the main store where the computer is located. A POS terminal has not been considered, due to its high cost. The present method seems to be handling the job quite well.

#### **Adding to the system**

The next step for the bookstore will be to add a general ledger program and perhaps even a hard disk. Wilke felt that with the quantity of floppy disks (12 or 15 now), he would be better off to have one of the hard disks offered for the TRS machine. Radio Shack's new 8.4M-byte hard disk system (\$4,495) may be a practical expansion peripheral for him.

Other features that he would look for if he were considering the system again would be the capability to support multiple terminals, with perhaps the ability to transmit information from the second store over telephone lines. He is very happy with his system, particularly since he can program some of his own applications, but he feels that he would be somewhat frustrated if he didn't know programming. He doesn't claim to be an expert programmer, but due to his classes, he has at least enough information to repair program bugs. Wilke attributes his success to the classes he took and says that "Radio Shack gives pretty good support."

Another user in a completely different field has applied an Apple II computer to an airline rental business. The system is used to print the rental tickets and generate reports on 10 aircraft, including maintenance and hours of use. The system consists of an Apple II with 48K of RAM, two disk drives, a printer for the rental tickets, and a second printer for statements. CashMaster is used with some additional customized software provided by an outside supplier.

This user (also totally unfamiliar with computers) suggests that anyone just getting started with a computer should know something about the computer prior to purchase. In fact, she feels that it would be helpful to know bookkeeping or even to have a course in computer-assisted accounting. □

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# WORD PROCESSING SOFTWARE

**Comparison of Programs  
for the TRS-80**

## by David D. Busch

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It's ironic that personal and business computers are not particularly well equipped to handle the one application that is so universally useful—word processing. Nearly everyone writes letters, memos, reports and other work that can be streamlined through some form of word processing.

Microcomputers are very facile with numbers, once they have been translated into binary. They cannot handle words at all, unless they are encoded into a logical numeric system. As a result, a WP program must be very complex. Couple a near-universal application with a great demand for software, and the result is a bountiful array of program choices. These many options lead to a very competitive marketplace, low prices and a mad scramble to introduce new features that will afford a given package an edge over its rivals.

That's precisely the case with word processing software available for the TRS-80 models I and III microcomputers. The three programs reviewed here—along with a fourth that is soon to be introduced—represent the third generation of word processing software as we know it. These programs are Lazy Writer (SSM Marketing, Garden City, MI), Pensa-Write 2 (Pensadyne, Vancouver, Canada), and Electric Pencil II (IJG, Inc., Upland, CA). The final entry, SuperScripsit, is an enhancement of the popular Scripsit 1.0 program (Radio Shack, Ft. Worth, TX). Although this program did not arrive in time for a full review, we were supplied with a list of its more interesting functions.

Happily, the latest generation of WP software reflects the demands of users. We've been given just about everything we thought to ask for—and some features we weren't far-sighted enough to anticipate. Here are four of the best of the new breed, with a rundown on their features and idiosyncrasies.

**Lazy Writer** is proof that simple and powerful can coexist. It is among the easier word processing packages to learn. It's one of the few that allow you to sit down and begin entering text a few minutes after loading the software.

Two modes exist, Edit and Text Entry, and these can be toggled simply by hitting the BREAK key. A reminder of this feature constantly appears in a status line at the bottom of the screen. This line also shows the number of characters remaining in memory, and position of the cursor. Moving the cursor around with the arrow keys also forces an automatic entry into Edit.

In Edit Mode, a variety of functions can be invoked by single letter commands. For example, "l" will load a file, "s" will initiate a save routine, while "h" brings in a useful explanatory "Help" file. The commands "d" and "i" are used to delete and insert text. Although it is extremely easy to toggle back and forth between the two modes, the program allows summoning some of the edit functions (all of those named so far) from Text Entry. The CLEAR key serves as a control key, which should precede one of the single letter commands. This may be faster for quick inserts or deletions, or for a quick check of

## Comparison of Features

<b>Program</b>	Electric Pencil II	Pensa-Write 2	Lazy Writer	SuperScripsit
<b>Distributor</b>	IJG, Inc. 1260 W. Foothill Blvd. Upland, CA 91768	Pensadyne 4441 W. 1st Vancouver, B.C. Canada V6R4H9	SSM Marketing 6250 Middlebelt Garden City, MI 48135	Tandy Corp. 1800 One Tandy Center Fort Worth, TX 76102
<b>Price:</b>	\$89.95	\$79.95	\$175	\$199
<b>Built-in LC driver</b>	Yes	No	Yes	Yes
<b>Definable keys</b>	No	No	Yes	Yes
<b>Control codes</b>	limited	Yes	Yes	Yes
<b>Maximum document size (In 48K computer)</b>	36K	19K	33K	estimated 30K
<b>Disk directory</b>	Yes	Yes	Yes	Yes
<b>Help file</b>	No	Yes	Yes	Yes
<b>Memory</b>	32K	32K	32K	48K
<b>Headers/Footers</b>	headers only	Yes	Yes	Yes

the help file.

However, much more powerful editing functions can be used in the Edit mode. Moving through the document is very fast. The cursor keys can be used, or the user can view successive "passes" by hitting the "a" key. Shift up arrow takes the cursor to the beginning of text from any point, while hitting ENTER twice moves it to the bottom. Fast moves in smaller increments—a word, sentence or paragraph—can be accomplished by striking a single key. Once the program has been used for a while, these moves become automatic.

While the lowercase "i" allows simple inserts of a few characters (or a word), this mode is rather slow, because the entire text is moved to allow space each time a character is entered. An uppercase "I" opens a large gap in the text, with only the single line following the insert displayed at the bottom of the screen. Blocks may be inserted much more quickly. Hitting ENTER makes any insertions permanent in the text. Until that point, however, additions may be canceled by pressing the BREAK key. This is a handy feature, but does require that you remember to hit that ENTER key before going back to Text Entry through BREAK. However, Lazy Writer does remind you, through a prompt at the bottom of the screen, to hit ENTER.

Deletions are similarly convenient, with "d" used to drop a character, "w" to delete a word, and "p" to eliminate an entire paragraph at one stroke. Blocks of material that have been marked using the block mode may also be dropped.

Other special features are available from Edit Mode. Typing "F" will invoke a prompt "Find what?" The user then types in a string to be searched for. If the first character of that string is a shift "@", the search will look for the string regardless of case—whether a character is upper or lower case will be ignored. Find and Replace can be used by separating the target and replacement strings with a "<". This is similar to the method used by Radio Shack's Scripsit.

Some types of repetitive editing functions (or any other task, for that matter) can be speeded up by using one of Lazy Writer's 10 user-definable multi-function commands.

To use this feature, press uppercase "x", select the key to be defined, then type in the command sequence.

These special function keys can also be summoned from text entry by pressing Shift BREAK. In addition, the commands can be stored on disk, and recalled at a later session, so that repeatedly used special function setups can become an integral part of a customized Lazy Writer program.

Block moves are accomplished by marking the text with parentheses from Edit mode. It is handy to use the "Remember Cursor" feature. The present cursor position can be marked by hitting "M", and a return to that point made by striking a lowercase "m".

A variety of special features would take an article of their own to describe. In a nutshell, here are some of the most outstanding:

- A disk directory is available from the program.
- An exit to DOS and a return to the program without destroying the text can be accomplished. In addition, there is a RESCUE/CMD program that can help resurrect some text when unwanted reboots or other problems occur.
- A built-in disk cataloging program allows compiling a list of directories of the users' disks.
- An RS-232 terminal program is built in.

To print a document, the user has the choice of setting all print formats from a printer menu (such as for a simple letter or other document that may not be used again). You may also embed formats in text, similarly to most word processors. Page width, length, centering (not found in all software) and reverse indenting are available, along with some more unusual commands, such as boldface, graphics characters and a "stop" command to halt the printer, for example, to change type fonts.

One nice feature is the "acceptable overflow" command, which allows some pages to be a few lines shorter than the specified page length. The program will then end the page at a paragraph end, rather than print one or two "widowed" lines at the bottom of the page.

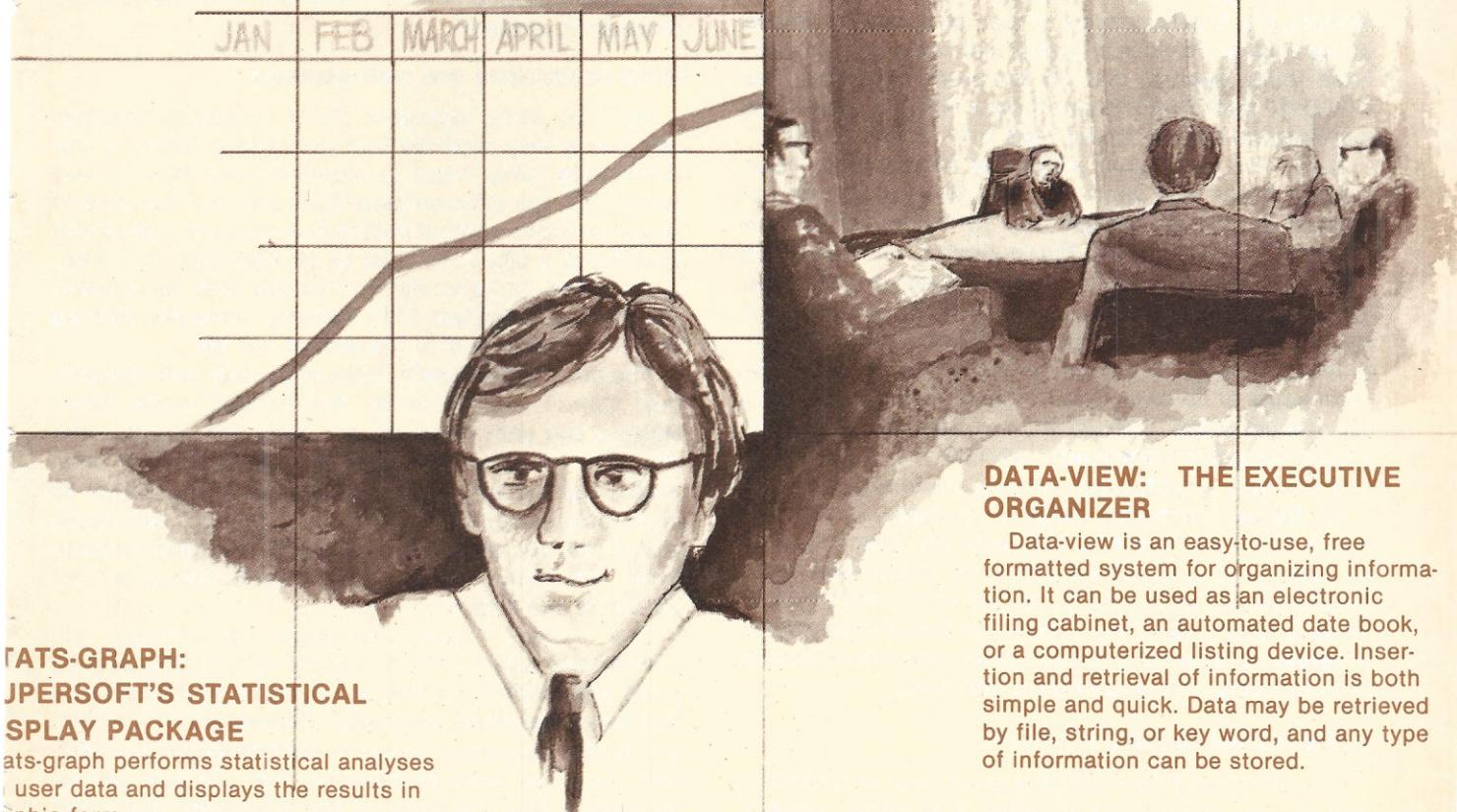
ASCII control codes can be embedded, the program may be instructed to chain files together, and print one

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long document after another. Headers and footers may be specified for odd or even pages only, or on every page, as desired. It is possible to save text to disk formatted exactly as the printer would see it. This feature makes it possible to send someone else—who may not own Lazy Writer or any other word processing program—a document. It can then be printed using the DOS PRINT command, with no need for a program.

**Pensa-Write 2**, at \$79.95, represents a bargain in an age when word processing software with these features is selling for \$100 to \$200 (and up). Text entry and editing is logical and easy to do, once the fairly complex layers of command have been learned. Those who have already learned a simpler word processing system, or who must switch back and forth between one system and another (at the office and at home, for example) may be confused. In addition, this system does not lend itself to quick and dirty work. It more closely resembles a dedicated word processing station that must be initialized at the beginning of a session.

For example, to use the program with the TRS-80 model I, it is first necessary to load an upper/lowercase driver routine. None is provided with the program, and I have found several that do not work correctly. The ULCDVR that Radio Shack offers with its lowercase modification for the model I will work satisfactorily.

Next, the user must enter the month, day, year, hour, minutes and seconds. The step cannot be bypassed, but it can be sped up by hitting ENTER six times instead of inputting the requested information. At this point, Pensa-Write 2 is still not ready for text entry. The program initializes in its COMMAND mode, which has ten basic sub-commands, one of which is EDIT. Enter EDIT to go to the next level, which has nine sub-commands of its own. One of these, MOD, takes us to yet another mode, with 20 more commands. These are single-character commands. ENTER "A" (for ADD), and you are, at last, ready to begin entering text.

All these commands must be entered in all caps mode. Other WP systems automatically switch input to all caps, except where lowercase is appropriate, as in Global Search string entry, or text entry. With Pensa-Write 2, you must either hold down the shift key while entering commands, or switch to all caps mode (usually shift 0) every time you enter a command.

#### System tries to save memory

This command tree allows a great deal of flexibility, but can be somewhat confusing and vexing when a function is desired that does not exist in the current command level. To save memory, only some of the functions will be resident in the system at any given time. It is sometimes necessary to load a file from disk in order to go on to the next level.

When ADDing text, if the user wishes to save the current file to disk, it is necessary to escape from ADD mode, go back to MOD, exit from that to EDIT, then back down the tree to WRITE. To make things interesting, each command level has a different procedure for leaving it. Shift up-arrow will force an exit from one of the single level commands back to MOD. To get out of that mode, you must enter X. Leaving EDIT is accomplished by entering END, and going back to the top level achieved by EXIT.

To see how this affects working operations, compare the procedure needed to make periodic saves of updated text during a long entry session. With SCRIPSIT, hit <BREAK>, "S", <ENTER>. With Pensa-Write 2, hit Shift Up Arrow, "X", <ENTER>, END,<ENTER>,WRI,<ENTER>,filename,<ENTER>, password (or just <ENTER>),<ENTER>,drive number. Then you get to make your way down the command tree back to ADD to continue.

Potential users should be aware of the way the program works, but should not be entirely put off. All of these procedures become almost second nature after you've used the program for awhile. The command structure seems confusing for a newcomer to the program, and learning the system may take longer. The necessity to bounce back and forth among levels does require additional time that may be undesirable. Outside of those two factors, I don't think that the configuration of the commands will bother most users after they become accustomed to them. After a few days, I zipped right along, happily taking advantage of some of the other powerful features of the program. In fact, some functions work faster than with other word processing systems.

#### MOD commands are well-planned

Here are some highlights of the various commands. HELP is a very nice file that provides a listing of the commands, what input is expected and how to use each. KILL (as differentiated from KIL) can be used to erase disk files without exiting the program. DIR allows specifying a directory read of all files, just text files, system files, program files or invisible files, as desired. DES clears out all text from memory, while KIL deletes text from the cursor to the end of the file.

The commands in MOD were especially well thought-out. Cursor control is by the familiar arrow keys. Holding the shift key with an arrow key doubles the speed of the cursor. In addition, hitting the "W" key, then a right or left arrow key will cause the cursor to jump one word. Entering a "B" or "E" will move quickly to the beginning and end of the text, respectively. (H) (home) returns the cursor to the upper left corner of the screen.

Two "insert" type commands are available. By moving the cursor with the arrow keys to the desired point and hitting "I", the text remains on the screen, and small insertions are made. Characters to the right and below the cursor move to accommodate the addition. As in all word processors, this process can be somewhat slow, because of the movement that takes place in memory. The program offers a second insert mode, "A" (ADD). Once the cursor is positioned, and "A" invoked, the screen clears, and large quantities of text can be entered as fast as the typist can strike the keys. Exiting from ADD (shift up arrow) brings the full text back to the screen, ready for deletions, or moving to the beginning or end of the file.

I especially liked the block move function. With several word processing packages I have used, block moves are accomplished with some awkward exchanges of blocks, hitting many keys just to make a simple move. With this program, simply move the cursor to the beginning of the block to be moved, hit "LEFT paren" (Shift 8), move to the end of the block and "close" the parentheses with shift 9. A pair of graphics blocks will

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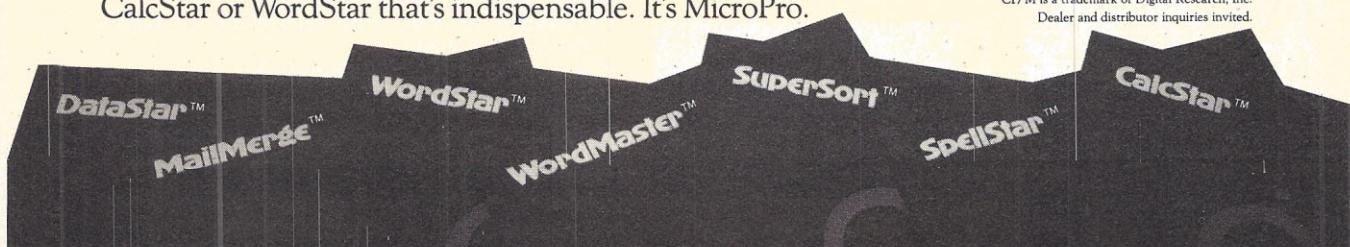
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frame the block to be moved. Then position the cursor at the exact point at which the block is to be inserted and strike shift 0. That's all there is to it. There's no labeling of blocks with letters, or need to unmark them either.

This is less powerful than systems that use labeled blocks, which can be exchanged and moved around much more flexibly. However, in actual use as a full-time writer, I find I do more simple block moves to a new location than multiple block rearrangement. I like the fewer keystrokes and simpler operation of this feature in Pensa-Write 2.

Text is deleted by positioning the cursor and hitting "D". One character to the right (not left as in other systems) will be gobbled up. Shift "D" will work twice as fast, while "W" followed by "D" will delete a whole word. Logically, Shift "W" + "D" really swallows up undesired verbiage.

Finding, searching and replacing are very easy with this system. One nice touch not found in all other WP programs is that Replace can be Global or "operator" prompted. One can tell the program to replace all occurrences of a word in text, or ask that each be presented in context for Y/N decision. The system will also just look for strings, which is a fast way of jumping from one section of a long document to another.

When the print module is loaded, the system displays the default values (which may be changed permanently). You may also embed other print format codes in the document itself. These include the usual page length, margin, justification and spacing instructions, as well as allowing the sending of non-printing ASCII printer control codes. Those with Epson, IDS or other printers that respond to these will appreciate being able to change print sizes and perform other controls from within a document.

Files can be linked through the format lines, so that when one file is printed (in a very long document), the next will begin immediately. Header/footer control is also very flexible, to the extent that it is possible to specify a different format for page one. "Wait at page end" (to allow printing single cut sheets of paper) is another standard feature.

In addition to the above, the program had some valuable quirks. It has a very useful status line at the top of the screen, which gives information such as characters used, memory remaining, number of words and whether or not the file has been saved yet. That could be a lifesaver for those who forgot to save their long files

from time to time as they input text. If you try to write over an existing file, the system will ask you if you are sure you want to do this.

**Electric Pencil II**, version 2.0Z, is an upgrade that will prove very easy for users to adjust to. Very little of the general operation has been changed from the original release of Electric Pencil. The text entry commands remain the same, although some unneeded functions have been eliminated.

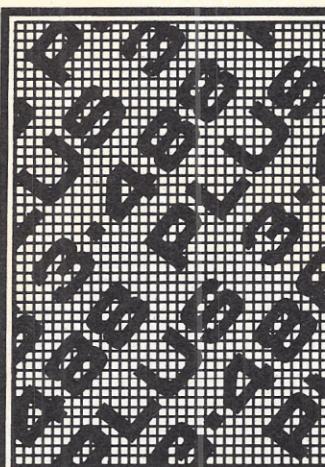
A complete, easy-to-use system menu has been enhanced, with file handling functions invoked by the normal commands (LOAD instead of DL, CLOAD instead of R, for example). A separate Print menu has been established. It is no longer necessary to install a control key—CLEAR is used for that purpose.

Text entry and editing are fast and simple. There is no need to go from one mode to another. The text remains on the screen at all times, and whether the operator is performing entry to editing is determined by the position of the cursor and the command keys that are pressed. The usual arrow keys control cursor movement. In addition, the cursor may be homed (Control Q), moved to the beginning or end of the text (Control B and E), or transported a page at a time through other codes.

The Control D or Control I key may be used to insert a character, while Control H allows adding entire blocks of text, similar to Pensa-Write 2 or Lazy Writer). Characters, lines, or blocks may be deleted with dedicated control keys of their own. The shift up arrow is used as a block marker character. Because blocks may not be labeled with, as with Lazy Writer or Scripsit, this system is a little less flexible in moving material around in a document.

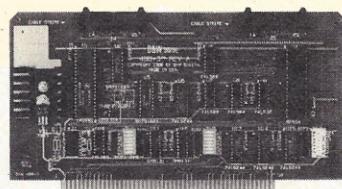
Global search is available, including "wild card" searches for partial character string matches. I found this system to be particularly convenient to use, because the Replace Function is automatic. When the user keys in a string to search for, the program asks for the string to replace it with. If Search only is desired, then the ENTER key is pressed, and no replacement takes place. Pensa-Write 2 also has something similar, but requires separate keys for Search, and Search and Replace. Both Lazy Writer and Scripsit 1.0 require extra keystrokes. It is possible to do "partial" global search and replacements by moving the cursor past a word that should NOT be replaced, then hitting Control C to continue the search.

One nice extra feature is the dictamatic function, which allows controlling a cassette recorder's start



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and stop by pressing shift enter. This is great for transcribing dictation.

Unlike most third generation word processors, the program does not have a status line on the screen at all times. However, the system menu can be checked at any time by hitting Control K. This menu shows the words used, free memory, plus commands available. Those with Exacon stringy floppies should note that Electric Pencil II can be supplied in a stringy floppy form, and supports @SAVE, @LOAD, and @NEW commands. A disk directory is available from the system menu, and only Pencil files (or all files) may be seen, as desired.

As in past releases of Electric Pencil, it is necessary to move the cursor to the beginning of the file, in order to save the entire file to disk. However, a warning that only part of the text is being saved is displaced in the system menu. This should help minimize what many feel is a shortcoming of the Electric Pencil system.

Another difference between the old Electric Pencil and other word processing systems was that it was not possible to embed print format instructions in the document. Instead, the default values were used, or new margins, page lengths, etc. could be set from the main menu. That has been remedied with Electric Pencil II. Headers are possible, and may be changed within a document as frequently as desired. Footers are not implemented. Only a limited number of printer control codes may be sent, and embedding ASCII codes in the text is not allowed.

**SuperScripsit** was not available at presstime, but the program should be in release by now. Like Scripsit 1.0, it promises to be a simple, powerful program with some of the failings of its predecessor resolved.

For example, SuperScripsit will allow viewing the disk directory, underlining, boldface, super and subscripts and pause for font changes or insertions from the keyboard. At last, those with all-Radio Shack hardware/software configurations will be able to take advantage of the capabilities built into Radio Shack's own printers.

Half-line spacing is allowed, as well as one header and footer per document. Disk-to-disk file copying is now possible.

For me, the big news is the ten user-definable keys, which can each store 127 characters worth of phrases or commands. I also liked the fact that documents can be preformatted and displayed on the screen exactly as they will appear when printed. I found it irksome to print out a document with Scripsit 1.0, find a one-line widow, and have to go back and insert a forced end-of-page marker.

This version of Scripsit is more menu-oriented (which should help beginners), and has a help list to explain commands. Even with these aids, Radio Shack still provides its cassette self-study course to ease first-timers into the various commands.

These WP packages represent what may be the final generation of word processing software. In the future, we'll see comprehensive "information processing" systems that include integral interfaces to dynamic spelling and grammar checkers, thesauruses and other reference works. For the present, there is a great deal that can be done with word processing programs like these. □

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# Business Software Forum



Computer software is a rapidly growing field. In fact, it's one of the most dynamic areas of business computing. As a result, there are many choices available to the user. This can be both a blessing and a curse. On the one hand, it offers a wide variety of programs to meet specific needs. On the other hand, it can also be overwhelming, especially if you're not sure what you need or how to evaluate different packages.

# General Ledger Software In The Balance

by Carl Heintz, CPA

*With this issue, IA launches a comprehensive survey of the vast array of available business software for microcomputers. In this and succeeding issues, we will focus upon software ranging from general ledger to statistical analysis, and for such diverse machines as the TRS-80 and the Alpha Micro. Our intent is to present a broad outline of the available software, with a meaningful comparison guide that our readers can use to aid in their selection of the "right" package. Our first survey focuses upon general ledger packages.*

*Future months will spotlight: accounts receivable/payable; financial planning packages (i.e. VisiCalc); payroll and cost accounting; inventory and order entry; word processing/editors; integrated accounting packages; graphics packages; data base systems and code generators; tax programs; programs for the medical/dental/veterinary fields; programs for CPAs and attorneys; programs for wholesale distributors; communications software; business programs for the Apple; business programs for the TRS-80 (I, II, III); and business programs for CP/M.*

What are the important features to look for in a general ledger package? The answer depends upon many factors, not the least of which is the nature of the particular application. Still, there are some common areas that should be considered before any choice of a particular package is made. Let's discuss these features in detail, in an effort to shed some light upon how a micro user can make a wise decision.

To begin with, don't start out by attempting to fit your business to the software—begin by defining what it is you need. The best way to do this is to get the undivided attention of your accountant or company CPA for a few hours.

Some of the issues that should be discussed are:

- 1) Will the general ledger be stand-alone or integrated with other packages, such as accounts receivable/inventory and payroll?
- 2) What kinds of reports will be required? Will the system be required to report on divisional activity, or consolidate various company branches? What kind of account structures will be necessary?
- 3) What will the volume of transactions be? What kind of storage capacity and equipment requirements will present themselves? Will the user buy a new system, or will existing equipment be used?
- 4) What is the degree of user sophistication? Will extensive hand-holding and user training be needed?

These are obviously open-ended questions. There are no correct answers—and each user will necessarily be a bit different. However, they will provide a starting point in the choice of a satisfactory program.

Once the preliminaries are settled upon, it is time to begin the task of evaluating individual programs. In our

software survey, we chose a number of factors that we felt were indicative of program quality—regardless of its particular design. For practical reasons, our list does not include two of the most important attributes. The first is ease-of-use, which can only be judged by a user with an installed system. We strongly recommend that a user and his accountant try the software on a system for an hour or so before purchasing it. Only then can you be sure that it runs, that the data entry sequence is comfortable, that the operating protocols are logical, and that the system will "fit in" with other programs used in the installation. Since just about every installation is unique, it is important to demo the package on compatible equipment. (For example, don't demo a program on a machine with a hard disk when you have only a 100K single density floppy on your system.)

The second attribute we couldn't include here is the nature of generated reports. When evaluating software, get sample copies of all the reports and take them to your accountant. Ask for guidance as to which reports seem to be the best. Look at the readability, inclusion of detail and suitability to your business. Don't expect any report to be perfect—all programs represent a number of compromises.

Some of the other attributes that our survey was unable to rank were operating speed, freedom from program bugs, and internal program controls and integrity. These are factors that can only be ascertained from actual hands-on testing.

When we began our survey, we expected to find hundreds of general ledger programs on the market (well, at least several dozen). To our surprise, there really aren't that many programs sold on a national basis, apparently because there aren't that many vendors who have decided to support their programs, or who have approached marketing from other than a regional basis. We uncovered many vendors who had written their own programs for their hardware customers. In many cases, these vendors had used the Osborne programs as a starting point, or had downscaled programs from minis.

Documentation is the beginning point to evaluate a general ledger, or any other accounting package, for that matter. Our questions centered on some key points in the manuals. For example, did the manuals have checklists covering the operation of the programs? We wanted to determine whether sample CRT screens were shown in the manuals as an indication of whether the manual fully explained the program operation.

#### **Best documentation includes extras**

Some programs include sample hard-copy input forms to help the user with implementation. While such forms are not a critical part of the documentation quality, we polled software vendors on this point, because the best software documentation that we have seen generally includes such extras. Another feature often seen in better program documentation is a section explaining a bit about accounting, helping the user to understand more about how accounting principles interface with the program.

A good indication of the care with which a program manual is put together is whether or not the writer has gone to the trouble of indexing it, or including a table of contents. Also, no documentation would be complete without copies of sample reports. One feature that we

expected would get a higher response was our query about program flowcharts. Sometimes a flowchart can be the key to a full understanding of a program and its interrelated parts. Very few of the respondents included such documentation.

When looking at a program manual, other items to look for include: discussion of the actual workings of the program; descriptions of the files used, their structure and contents; trouble-shooting guide, with symptoms, causes and solutions; and error-recovery procedures and safeguards.

The issue of source code has been a sore topic for many software vendors. Many programs are written in interpretive Basic, such as Microsoft Basic. In these programs, the user is provided with program code that is human-intelligible and can be modified. Software

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## ***Most users want to employ their micros for more accounting functions than just general ledger.***

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vendors often provide programs in non-intelligible code, which is machine-readable only. The programs are generally written in CBasic or a compiled version of Microsoft Basic. Modifications are virtually impossible, and the user must hope that the software company stays in business for the life of the program. Is this really a critical issue for the purchaser? In all but the most simple of programs, probably not. If the user plans on making extensive software changes, it is generally better to start fresh. Patches to existing packages more often than not result in disasters. With the current wide availability of programs such as Formula or Pearl, which write applications code (or data base managers such as Dbase, which replace them), the choice to users is now much larger. Our advice: don't plan on buying a package and modifying it.

Most users want to employ their micros for more accounting functions than just general ledger. Our survey revealed that most vendors of general ledger software realize this too, and offer additional packages that (together with their general ledger packages) form a complete series.

The "big-5" software packages include: general ledger, accounts receivable, accounts payable, payroll and inventory. Most vendors replying to our survey had these packages, many of which were integrated with the general ledger system. In some cases, this integration allowed the user to update the general ledger from the other applications packages—i.e. the receivables package creates an automatic journal entry to the general ledger package for the cash receipts entered. The only danger in this sort of interfacing is the possible lack of audit trails. Sometimes a package will update

# Offering CPAid

General Ledger II by CPAids, (Kent, OH) is billed as an accountant's "write up and payroll" package. It is designed for the CPA who has monthly clients and wishes to computerize the process of preparing his books and records. There is no reason, however, why the system cannot be used by small businesses, as well.

The system is supplied on CP/M compatible disk. It requires at least 48K of RAM and a two-disk system with a storage capacity of at least 315K per disk. The programs are available in either compiled or interpretive Microsoft Basic. A CRT with an 80 by 24 capacity and direct cursor positioning is required, as is a printer with at least an 80-column capacity.

The programs consist of several modules that include general ledger, payroll, depreciation, amortization and utility programs.

The manual is quite complete, and includes a flow chart of the program steps, a complete set of installation instructions and some helpful examples. The company producing the software has been around for a while and is similarly helpful—knowledgeable and eager to help users achieve a successful implementation. The programs were written by Andy Rosenberg, who, as a practicing CPA himself, knew what accountants were looking for in a microcomputer program.

One way to gain an insight into the architecture of any set of general ledger programs is to focus upon the manner in which the system uses the chart of accounts. For some reason, this has always been a difficult area for programmers and accountants to agree upon. The programmers use the chart of accounts in a different way than the accountants generally do, and in no other area are the differences between a manual system and a computerized one more likely to be apparent.

The scheme used by this program is a variation on a very popular method of handling the chart of accounts. Basically, the accounts (of which there can be a maximum of 400) consist of an eight-digit code in the format: "ABCDE.FGH". The first digit, A, is used to indicate the type of account it is: assets, liabilities, equity, revenues, expenses or non-operating revenue.

The second and third numbers (B and C) are used to indicate the account. Thus there may be up to 100 asset accounts, etc. The fourth number, D, is used to indicate a department number. There can be a total of 10 departments possible in a system. The fifth digit, E, is used to indicate the manner of placement of the account in the financial statements. A bit of explanation is in order on this point. The chart of accounts includes a number of accounts that contain no balances. These dummy accounts are used to format the financial statements. In other words, the assignment of the chart of accounts is really analogous to taking the financial statements and assigning a number to each line—even the blank lines, titles, subtotals, totals, comments and headings. Does this sound simple? It really isn't all that complex, and doesn't take too long to do. However, it does impose some limitations upon the user. For example, it takes craft and ingenuity to combine several

general ledger accounts into one amount on the financial statements, and even more skill to call something on the financial statements by a different name from that used by the account in the general ledger.

The importance of these two tricky areas becomes evident upon reflection: suppose the company has three bank accounts and wants to show them as one figure "cash" on the financial statements? Under the standard set-up, there appears to be no way to accomplish this, since there is a line in the financial statements for each account. Using sub-accounts, though, one can get around the problem. These same sub-accounts help a user to call a general ledger account by a descriptive name, such as Loan 48665, and still make the financial statements look nice by calling it "Loans Payable."

The "FGH" part of the account structure is assigned by the program, and is not available to the user. It is used to keep track of record numbers and other interesting features.

The use of this account-coding scheme gives some flexibility to the formatting of the financial statements—far more than a program such as Boss (distributed by Lifeboat Assoc., New York, NY), but far less than the editor system used by Palintir's general ledger system (distributed by Designer Software, Houston, TX). On the other hand, the system adopted imposes a number of restraints upon the user in the area of numbering of accounts—since the real account numbers are really only three digits long. As in most things, there are compromises, which make sense when balanced.

Another compromise that accountants have long accepted is the issue of year-to-date detail general ledgers. Most systems just don't have the capacity to store an entire year's data in the system. Accordingly, they adopt the "balance forward" approach, in which each month's detail general ledger has the beginning balance, the activity for that month only and the ending balance. The CPAids system allows a user to maintain a historical general ledger containing all of the activity for that entire year. It does so through a clever design that includes using two general ledger files. One file, which is kept on the regular disk, is just like the regular systems that have balance forwards. If the user opts, though, he may install a system that includes a separate disk devoted entirely to general ledger detail files. This disk can hold 5,000 transactions easily, and thus has the capability to keep an entire year's detail general ledger.

The regular general ledger files also include historical information—in the form of the balances for the last twelve months. This information is useful in the construction of financial statements and analysis.

The financial statements depend to some degree upon the ability of the user to follow directions and model his situation after the examples in the manual. With only minimal effort, however, the user should have no trouble creating very useful and pleasant-appearing financial statements. The user can create income statements for the month only, or a two-column income

# **"Accounting, if done correctly, should be on ...a double-entry basis."**

## **Offering CPAid...**

statement (four if you count the percentage calculations), which has the current month and year-to-date or any other period-to-date shown. (In other words, the user could prepare a statement that contained the quarter-to-date, or the last six months-to-date, etc.)

The balance sheet options include a regular balance sheet containing only one set of figures, and a comparative balance sheet that can contain the year-to-date and any other period, including the last year's figures.

Transaction entry is of fundamental importance to a general ledger system. The CPAids system has a rather interesting approach to it. The files used to store transactions are sequential in their structure, which means that if the user has made entries previously that have not yet been posted, he gets to watch them all again as the system opens the file, reads all the previous data, and finally reaches the end of file. It's a quirk of Basic sequential files that the system must look at all the files starting from the beginning in order to find the end. Such a process can take several minutes if a number of entries have already been made, and just a few are yet to be entered. It is, however, one of the design consequences of using sequential files.

The journal-entry procedure allows the user to specify a journal type, a 15-character description, a six-character reference number and a date. When an account number is entered, the system looks it up and displays the account name. The system makes entries in batches of 15 lines per screen. There is no necessity to limit a journal entry to 15 lines, though, because the system will allow one to enter a screen full of data, even if it is out of balance. However, it will give a warning indication that the entry is out of balance. The entry sequence includes such helpful features as the ability to duplicate fields, to increment items (such as the check numbers) and to edit the entry at any time prior to writing it to the

the general ledger, without the necessity of creating a listing of the journal entries that it is making. This can result in tremendous headaches in the case of errors, or in a situation in which hardware problems affect files. The best interface is one in which an intermediate transfer file is created to summarize the activity from the other packages. This file should be listable, and editable before being posted to the general ledger.

Accounting, if it is done correctly, should be on what is known as a double-entry basis. That means for every dollar of debit, there is a corresponding and equal dollar amount of credits entered into the system. All of the packages we surveyed employed double-entry accounting, but some were more double than others. For example, in the Glector and the Data Index packages, the user makes one-sided entries—the computer figures the corresponding "other side." This is usually done by specifying an entry type. For example, in the case of cash disbursements, the user will enter all of the check amounts and their distribution; the program will make the corresponding credit to cash. These systems work after a fashion, and perhaps are advan-

file. The program uses about 41 bytes for each transaction line. Referring to our previous discussion about year-to-date history disks, it's not too hard to calculate how many transactions a 300K disk would hold—about 7,000 total.

There is one aspect to the transaction-entry sequence that will be unusual to the non-accountant. Anyone familiar with accountant's adding machines usually knows that the accountant doesn't enter decimal points when adding figures—the machine puts them in automatically. For example, when an accountant puts 20000 into his calculator, the machine interprets it as 200.00. The CPAids program works the same way. Decimal points are not entered. Instead of using DR and CR, the CPAids program uses positive numbers as debits and negative numbers as credits. This takes some getting used to, particularly since accountants are used to thinking in terms of the number first, then its disposition as a debit or a credit.

The system includes a complete fixed-asset accounting module. It is not integrated into the general ledger, however, so it will not make entries directly to those files. However, it does just about anything else needed. It has the capability to maintain up to three separate forms or classes for each client. Within each class, there may be up to 1,000 assets for each schedule. The system will calculate depreciation using the straight line method, the sum-of-the-years digits method, the declining balance method, or the ACRS (Accelerated cost recovery system) for assets purchased after 1980. The system has an automatic change from accelerated-to-straightline in order to achieve maximum depreciation in the current year. It also has safeguards to insure that an asset is not depreciated below its cost or salvage value. There is the capability to override the automatic calculations, also. One of the nice features of the system includes the ability to have it calculate and summarize the current year's investment tax credit.

tageous for those with no accounting training. However, their flexibility is necessarily limited, especially when complex adjusting entries are required. Most accountants would agree that if the user doesn't possess the sophistication to understand both sides of an accounting entry, he shouldn't keep his own ledger.

The manner in which an accounting system handles the chart of accounts gives a good clue as to the whole architecture of the system. There seem to be two categories of general ledger programs. In one, the choice of the chart of accounts is entirely up to the user, within the limitations of the system. These programs have little link between the chart of account numbers and the structure of the financial statements. Usually, a report writer is used to generate whatever financial statements are required, and they allow the user to put together his financial statements in whatever format he desires. While gaining a lot of flexibility, such systems lack simplicity. Setting up financial statements can be a tedious and time-consuming task. The results, however, often more than justify the effort. Special analyses and fancy schedules are no problem for those programs.

The system keeps track of assets by asset numbers. Additionally, there can be up to 10 forms, so that with a little ingenuity, the system can be used to indicate asset location or department location. Further, the system includes the capability to calculate depreciation on tax basis as opposed to historical cost—a minor point that can be of major significance in certain tax situations.

As an additional program, the package includes a short program that produces an amortization schedule for loans and other interest-bearing obligations. The system is somewhat unsophisticated, since it does not account for any balloon payments, nor does it differentiate between stated interest and APR interest. However, in simple applications, it could prove useful. As in the case of the depreciation programs, there is no interface to the general ledger program.

The package includes a number of interesting utilities programs, including an editor and a program for generating the statement of changes in financial position.

The editor allows the user to change client names, alter accounts, change year-ends, and even change account amounts. Its use is obviously to be done with care, since it leaves no trail. The editor can also be used to look at the contents of a data file, or may even be used to delete an account, change journal data (including amounts, account numbers, dates, etc.). While there are sometimes needs for such procedures, the presence of such powerful programs without the structure of a backup and a procedural framework (such as a regular accounting entry) could lead to trouble if used indiscriminately.

The Statement of Changes in Working Capital program is designed to step the user through the preparation of the statement. It basically consists of an analysis of the current assets and current liability accounts, during which the user determines the nature of the changes in the components of working capital. Then there is a walk-through analysis of all changes in non-working

The other approach towards the chart of accounts (and by far the most common method) is an adaptation of a scheme used for years on mainframe computers. The programs limit the user in the freedom of choice in the use of account numbers, because the account numbers are used as an integral element in the layout of the financial statements. A classic example of this is the CPAids chart of accounts structure (reviewed in the accompanying article). The Structured Systems Group general ledger is another good example: the coding of the chart of accounts sets up the general ledger, but it simultaneously formats the financial statements. Such a scheme is generally much easier to use, but does bind the user to some conventions.

The extension of this approach is one in which the chart of accounts is set, with very little modification possible. The Boss system employs this approach. While at first glance such a system seems arbitrary and almost like a straightjacket, the simplicity of it is sublime. What's more, what the user lacks in account choice flexibility, he gains many times over in report capabilities. In the Boss system, for example, there are literally

capital accounts. Each account is displayed with changes shown. The user explains the changes in the account (up to 40 characters per line item) and classifies the item as to where it will appear on the statement of changes. From a technical standpoint, the program appears sound, and quite usable. From the pragmatic standpoint, the program will not save too much work over the manual method of preparation.

The payroll system is designed to interface with the general ledger program, and additionally to be a stand-alone system, capable of calculating payroll and printing checks. Most accountants only need a payroll "after the fact" system, which is used as an extension of the general ledger system to record the client's payroll transactions and accumulate data for each employee to be used in the preparation of quarterly payroll tax reports, and the year-end payroll reports, which include W-2 forms.

The program includes the option of calculating deductions from built-in tables. The system will handle hourly or salaried employees, and has provisions for regular and overtime earnings, as well as Tip income. There are provisions for the standard federal income tax withholding, state withholding, social security and up to three municipal taxes (which could be used for Union dues, insurance, etc.) The system also has a column for non-taxable income, and advanced EIC payments. Overtime is paid at a flat 1.5 times straight time rate.

Since the income tax tables change quite often, the programs include complete instructions on how to modify the tables.

The package represents a workable client accounting program that has been used by hundreds of accountants very successfully. It does not represent state-of-the-art software with a lot of fancy bells and whistles. On the other hand, the programs work effectively, and should serve both businessmen and accountants well. □

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dozens of reports that would be impossible to prepare under any other system, or would take literally weeks of programming. But the trade-off has its cost.

Our survey included a few admittedly trick questions. We wanted to determine whether the available software measured up in the areas of program and accounting controls. One of the questions was whether or not "one-sided entries" were allowed. Theoretically, in a good general ledger system, only two-sided entries should be allowed. Much to our amazement, almost half of the respondents stated that their software allowed users to make an entry without the corresponding offset. In other words, their software had no controls to prevent the ledger from going out of balance. Another trick question asked whether entries could be made to accounts that hadn't been set up yet. We wanted to find out whether a system would allow a user to make an entry that ended up "hanging in space." Again to our surprise, there were a few systems that allowed this to happen. In most of them, though, an error report was generated, which gave the user a starting point to solve the problem.

A third area in which we attempted to find problems was in the maintenance of accounts. Some programs allow the user to go into the general ledger detail and edit it directly. While changing names of accounts is acceptable, should a user have the capability of editing the general ledger detail (possibly changing descriptions, numbers, totals, etc.)? Such power generally gets a user in trouble. Conservative design would dictate that only journal entries can be made to change the contents of a general ledger account.

The capacity of a general ledger program is an area of great concern to most users. Our survey attempted to assess this by probing in several areas. The size of the account numbers was one indication. However, it really doesn't tell too much unless the user understands how many accounts the account-coding structure translates into. We asked the question directly, but again, the results are confusing unless a specific hardware configuration is given. Most of the software vendors have different versions for different machines, and the capacity of the system often depends directly upon the size of the disks used. Most of the numbers supplied, though, tended to indicate that for all but the most demanding applications, all of the software has enough capability to handle the average small business (assuming that the hardware was of sufficient disk capability). Another perspective on the issue of capability was addressed in our question on the largest dollar capability. The responses indicated that even the smallest system had the capability for totals in the millions.

### **Survey finds two ledger systems**

There are two generic classifications of general ledger systems that seemed to emerge as a result of our survey. First are those systems that are akin to "balance forward" systems. They carry forward only the ending balance in each account from one month to the next. The historical detail is lost each month when the accounts are closed. This seemed to be the most popular method. (Considering the storage capability of most floppy disks, it is understandable.) The other approach is to leave as much detail as possible, and purge the older detail as the system gets full. This method requires the program to have some degree of

sophistication in handling dates. A third alternative is a hybrid method using two diskettes—an ancillary diskette is dedicated to contain a historical general ledger file. While switching diskettes may be somewhat inconvenient, this scheme seems to solve the problem.

One problem in attempting to compare reporting capabilities of different general ledger systems is that no two systems have exactly the same reports, and in many cases, a user really has to see exactly what they look like in order to determine whether they are appropriate or pleasing to the eye. However, we did determine a few interesting characteristics.

### **Rounding-off function was queried**

Our first question ascertained whether the system could produce reports with cents rounded off. This feature is nice, because it often makes the reports easier to read. Only a few systems allowed for it. The next inquiry was whether dollar signs were shown on the totals. Again, mostly a cosmetic item, but indicative of the system's sophistication. The questionnaire also attempted to determine whether double underlining was done on totals, and whether the account numbers were printed on the statements. The presence of account numbers on the statements was a tip-off to us of a relatively unsophisticated program.

We also wanted to find out whether a program would produce the "Statement of Changes in Financial Position" or so-called funds flow statement. Most of the programs had some provisions for producing it, although among the few that we investigated in depth, they weren't automated entirely, requiring input from the operator at the time of preparation.

Many of the programs that used the chart of accounts to format the financials allowed the user some latitude in the descriptions used by setting up "dummy accounts" that contained descriptions, and instructions on subtotaling, etc. The degree of flexibility was hard to assess in the absence of the program, but a potential user should investigate it in depth before purchase. Of particular concern should be the ability to account for branches (either separately or in combination). Also important is the ability to combine accounts on the financial statements (for example, to consolidate three bank accounts into one figure for cash on the financial statements, or three sales accounts into one consolidated sales account). Many of the systems appeared to have some flexibility, but the user should lay out his specific requirements and discuss these with his accountant before committing to a particular program.

Almost all of the programs had some form of percentage calculations on the income statement. Unusual, though, were the features of the Boss System, which calculated financial ratios such as current assets, inventory turnover, and return on investment in addition.

The information in the accompanying charts was compiled from information submitted by software vendors. While every attempt has been made to insure accuracy, there may be differences in interpretation of questions, and certain software may have other features not listed here.

The following numbered notes correspond to the chart column headings:

- 1) Language - Indicates which language the system has been written in. The abbreviations are:

- B - Basic, MB Microsoft Basic, CB - CBasic, FOR - Fortran, ASM - Assembly language, C - Cobol, NB - NorthStar Basic
- 2) Source Code - Indicates whether Supplied, Available, or Not available.
  - 3) Support Hotline - indicates whether a support hotline exists. Generally not a toll-free WATs number.
  - 4) Series - indicates whether other programs are part of a series or related package. See #6
  - 5) Integrated - Indicates whether the other programs are integrated into this package. (whether they communicate via file transfers, etc.)
  - 6) Other programs in series - include -
    - Big 5 - inventory, accounts receivable, accounts payable, payroll and general ledger
    - O/E - order entry
    - P/R - payroll
    - C - cost accounting
    - P/O - purchase order accounting
  - 7) Checklist - does the documentation include checklists to help the user implement the program?
  - 8) CRT Screens - does the manual have samples of the CRT screens used by the program?
  - 9) Flow Charts - are they included?
  - 10) Blank Entry Forms - does the documentation include a series of "templates" or blank forms to help the user organize his data for use on the system?
  - 11) Index - does the manual have a good index or table of contents?
  - 12) Sample Reports - are they included in the manual?
  - 13) Is the system a double entry system?
  - 14) The number of digits in an account number. This includes sub accounts and (where provided) shows how many major/subaccount codes are possible (i.e. 4 + 2 is four-digit account code plus a two-digit sub account code - XXXX.XX.)
  - 15) Can the user specify the account number ranges? Or are they set by the system? In other words, does the user have latitude in establishing his own chart of accounts on the system?
  - 16) Can a user unclose a month to add more detail (journal entries)?
  - 17) Are sub accounts available on the system?
  - 18) Can recurring journals, such as the depreciation entries, be made automatically on a month-to-month basis?
  - 19) Is a journal entry "type" shown? (Such as CD for cash disbursements, CR for Cash Receipts, etc.)
  - 20) The number of accounts (maximum) that the system can accommodate. "Disk" means that the capacity of the system depends upon the disk capacity of the user's hardware.
  - 21) The number of transactions (entries) maximum that the system can accommodate in any one accounting period (month). "Disk" means that the capacity depends upon the user's hardware.
  - 22) The dollar capacity in digits that the system will accept. (For example, 8 digits equals 999,999.99.)
  - 23) Does the system allow the user to make "one-sided entries," or entries for which the debits do not equal the credits?
  - 24) Does the system allow users to make entries to accounts that have not been set up on the system?
  - 25) Does the software require a batch listing of journals before posting to the general ledger?
  - 26) Can the user access the data files directly to edit dollar amount data (without making a journal entry)? "Yes" indicates an accounting weakness (possible lack of audit trail).
  - 27) Does the system allow a historical ledger by storing multiple months data?
  - 28) How many description spaces are available for the journal entry information and the GL?
  - 29) Can the user display contents of a general ledger account on the CRT (terminal)?
  - 30) Are historical figures kept on the general ledger (generally one month end-total for each account for each month)?
  - 31) Is budget data kept on the general ledger (generally one budget figure for each month for each account)?
  - 32) Is a trial balance prepared? A trial balance is a listing that has each account, the beginning balance, changes for the month and ending balance.
  - 33) Does the program allow the user to specify the rounding off of cents? (Are dollar amounts only shown on the financials?)
  - 34) Does the system show dollar signs besides totals?
  - 35) How many columns are shown in the income statement?
  - 36) Is the Statement of Changes in Financial Position (funds flow statement) prepared?
  - 37) Can the user specify what the titles on his financial statements are to be?
  - 38) Can the user combine several general ledger account balances to one figure on the financial statements?
  - 39) Are percentages calculated and shown on the income statement?
  - 40) Is an editor used to construct the financial statement layouts?

Undoubtedly, there are several fine general ledger packages that aren't included in our comparison charts. In some cases, the vendor didn't respond to our inquiries, and an appropriate spokesperson couldn't be reached during our follow-up calls. Or we may simply have missed a few companies in our initial research. We'd like to hear about any good packages that our readers are aware of that might be included in future editions of the survey.

The results of the survey indicate a growing sophistication in the quality of business software available. While there are a number of similarities between most of the packages, the average user has a good variety of choices to find the best package to suit his particular needs. □

### **Charts follow**

### GL Feature Comparison

Company	Price	For What Hardware	Language	Other Programs in Series											Manual Documentation		# Digits in Account # Range?	
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	
Business Applications Software	\$ 390	CBasic II, CP/M	B	S	Y	Y	Y		A/R, A/P	N	N	N	Y	N	Y	Y	4+4	Y
Charles Mann	\$ 550	Apple	—	S	Y	Y	N		Construction, Job Cost	Y	Y	Y	N	N	Y	Y	4	N
Complete Business Services	\$ 300	North Star H/O	B	S	Y	Y	Y		Big 5, O/E	Y	Y	Y	N	N	Y	Y	4+2	Y
Compumax	\$ 350	CP/M 8-in./STD 5 1/4-in. Micropolis, Apple	MB	S	Y	Y	Y		Big 5, C	Y	Y	N	N	Y	Y	N	4	N
CPAids	\$ 450	CP/M	MB	A	Y	N	N		P/R, Tax, Property	Y	Y	Y	N	Y	Y	Y	5+3	N
Dakin5 Corporation	\$ 625	Apple II, II+	ASM, Applesoft	N	Y	Y	Y		A/R, A/P	Y	Y	N	Y	Y	Y	Y	5	Y
DASI	\$ 750	CP/M, TRSDOS 64K Necessary	MB	S	Y	Y	Y		Big 5, C	Y	Y	N	N	N	Y	Y	4+2	Y
Data Index	\$5,600	IBM I	EDL	A	Y	Y	Y		Big 5	N	Y	Y	N	Y	N	Y	4+6	Y
Designer Software	\$ 850	CP/M	Compiled, C, ASM	N	Y	Y	N		A/P, A/R, Property	Y	Y	N	Y	Y	Y	Y	6	Y
Digital Technology	\$ 599	Ohio Scientific	MB	S	Y	Y	Y		Big 5, O/E, P/R	Y	Y	N	N	N	Y	Y	5	Y
Dynamic Microprocessor	\$ 595	CP/M	FOR	N	Y	N	Y		Data Base, A/R, A/P	Y	Y	Y	Y	Y	Y	Y	7	Y
Lifeboat Associates	\$2,450	CP/M, 2 disks, 48K TPA	MBC	N	Y	Y	Y		Includes A/R, A/P	Y	Y	N	Y	Y	Y	N	3	N
MicroAp, Incorporated	\$ 350	Req Selector CP/M	CB	N	Y	Y	Y		Data Base	Y	Y	N	N	Y	Y	N	5	N
Microed	\$ 450	CP/M	FOR	N	N	Y	N		Big 5	N	Y	N	Y	Y	Y	Y	28	Y
Micro Mike's	\$ 750	North Star, CP/M+	B	A	Y	Y	N		Big 5	Y	Y	N	Y	Y	Y	Y	4	N
Modern Microcomputers	\$1,000	CP/M	CB, MB	A	Y	Y	Y		A/R, A/P	Y	Y	N	N	N	Y	N	3	N
National Software Marketing	\$ 600	TRS-80 model II	B	S	Y	Y	—		includes O/E, A/R, A/P	N	Y	Y	N	N	Y	Y	6	Y
Occupational Computers	\$ 495	TRS model I, II, III, CP/M	MB	S	Y	Y	Y		Big 5	Y	Y	N	Y	Y	Y	Y	4+4	Y
Omni Software	\$ 150 \$ 150	North Star NS DOS	B B	S	Y	Y	Y		Big 5 (no inv) Osborne	Y	N	N	N	Y	N	Y	3+2	Y
Peachtree	\$300-\$600	CP/M+, Apple II, TRS-80	MB	S	Y	Y	Y		Big 5, O/E	N	Y	Y	Y	N	Y	Y	6	Y
Personalized Computers	\$2,000	OASIS	B	S	N	Y	N		Big 5	N	N	N	N	Y	Y	Y	6	Y
Quicktax, Ltd.	\$500-\$2,500	CP/M, MDOS	B	N	Y	Y	N		includes Tax, A/R, Mail List	Y	Y	N	Y	N	Y	N	6	N
Radio Shack	\$ 100 \$ 199 \$ 499	Model III, I Model II Model II	B B C	S	Y	Y	N		Big 5	Y	Y	Y	Y	N	Y	Y	4	N
Relational Systems	\$ 495	CP/M	CB	S	Y	Y	Y		Big 5	Y	Y	N	Y	Y	Y	Y	4+2	N
Serendipity Systems	\$ 169	Apple II+	B	N	Y	Y	N		Inv., Stat	N	Y	N	Y	Y	Y	Y	3+1	—
Software Technology	\$275-\$450	Apple	ASM	N	N	Y	Y		Big 5, Data Base	Y	Y	N	Y	Y	Y	Y	5	Y
STR Corporation	\$195-\$675	OASIS	B	N	Y	Y	Y		Big 5, O/E, P/O	N	Y	N	Y	Y	Y	Y	9	Y
Structured Systems	\$1,250	CP/M	CB	A	Y	Y	Y		Big 5, O/E	Y	Y	Y	Y	Y	Y	Y	6	N
Systems Plus	\$2,500 —	CP/M CP/M 350K MP/M minimum	CB CB	N	Y	Y	Y		Big 5 Included A/R, P, O/E, P/R	N	Y	N	N	Y	Y	Y	6	Y
TCS Software	\$1,795	CP/M, 57K	MB	A	N	N	N		—	Y	N	N	N	Y	Y	Y	6	Y
Technico	\$2,000	TI-32, CP/M+, Proprietary	B	A	Y	Y	N		Big 5	N	Y	Y	Y	Y	Y	Y	4+3	Y
Technology Systems	\$ 500	North Star or CP/M 2.2 + NS Basic	NB	S	Y	Y	Y		Big 5, O/E	Y	Y	Y	Y	Y	N	Y	6+2	Y
TLB Associates	\$3,495	CP/M	PL/I	A	N	Y	Y		includes Big 5	Y	Y	N	Y	Y	Y	Y	4	Y
Univair, International	\$ 500	CP/M, 48K 256K or H/O	C, B	N	N	Y	Y		Big 5	Y	Y	N	N	Y	Y	Y	4	N
Vadata	\$ 295	CP/M, CBasic II	CB II	S	N	Y	Y		A/R, A/P, Payroll	Y	Y	Y	N	Y	Y	N	5+1	Y

**GL Feature Comparison (continued)**

Company	Reports																								
	Unclose Month?	Sub-Accounts	Auto-Recurring JE	JE Type Shown	# of Accounts	# of Transactions	\$ Capacity (Digits)	One-Sided Entries?	Undefined Accounts	Batch Listing Prepared	User Modify Data	Store Multiple Mo. Data	Description Spaces	Account Inquiry @ CRT	Historical Figures	Budget Figures	Trial Balance	Optional Cents Round-Off	\$ On Totals	Columns in Reports	Stmtnt. of Acct. Prepared	Specify Titles	Combine Accounts	Percentages	Editor Used
	16	17	18	19																35	36	37	38	39	40
Business Applications Software	Y	Y	N	Y	Disk	Disk	10	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	8	N	Y	Y	Y	Y
Charles Mann	Y	Y	Y	Y	—	6,000	14	Y	N	Y	Y	N	35	Y	N	Y	Y	N	Y	—	Y	Y	N	Y	Y
Complete Business Services	N	Y	N	Y	Disk	Disk	10	Y	N	Y	N	Y	25	Y	Option	N	Y	N	N	4	N	Y	N	Y	N
Compumax	N	Y	Y	Y	350	1,000	11	Y	N	N	N	N	30	Y	N	N	Y	N	N	3	N	N	N	Y	N
CPAids	Y	Y	N	Y	400	1,000	9	Y	N	Y	Y	Y	15	Y	Y	N	Y	N	Y	4	Y	Y	—	Y	N
Dakin5 Corporation	N	N	Y	Y	250	1,000	10	N	N	Y	N	N	—	N	Y	N	Y	Y	Y	2	N	N	Y	N	N
DASI	N	Y	N	Y	2,000	8,500	10	N	N	Y	N	Y	20	Y	Y	Y	Y	N	N	4	N	Y	Y	Y	N
Data Index	Y	Y	Y	Y	10,000	Disk	12	N	N	Y	N	Y	24	—	Y	Y	Y	N	Y	4	Y	Y	Y	N	N
Designer Software	Y	Y	N	Y	47,234	Disk	—	Y	N	Y	N	Y	30	Y	Y	Y	Y	Y	Y	—	Y	Y	Y	Y	Y
Digital Technology	Y	Y	N	Y	800	999	9	N	N	N	N	N	25	Y	Y	N	Y	N	N	4	N	N	N	Y	N
Dynamic Microprocessor	Y	Y	Y	Y	Disk	Disk	—	N	N	Y	Y	Y	10	Y	Y	N	Y	N	Y	—	N	Y	Y	Y	Y
Lifeboat Associates	Y	Y	Y	Y	900	9,000	10	N	Y	Y	Y	N	25	Y	Y	N	Y	Y	Y	12	Y	N	Y	Y	N
MicroAp, Incorporated	Y	N	Y	Y	220	2,000	10	N	N	Y	Y	Y	25	Y	Y	N	N	N	N	6	Y	N	N	Y	Y
Microed	N	Y	N	Y	Disk	Disk	8	N	N	Y	Y	Y	40	N	Y	N	Y	N	Y	—	N	Y	N	Y	Y
Micro Mike's	Y	N	N	Y	500	Disk	10	N	N	N	Y	N	25	Y	N	N	Y	N	N	4	N	N	Y	Y	N
Modern Microcomputers	Y	Y	N	N	600	Disk	10	Y	N	Y	Y	N	20	Y	Y	Y	Y	N	Y	—	—	N	N	N	—
National Software Marketing	N	Y	N	Y	256	1,100	11	Y	N	Y	N	N	20	Y	Y	Y	Y	N	N	3	N	Y	—	Y	N
Occupational Computers	Y	Y	Y	Y	2,000	12,000	13	N	N	N	Y	30	Y	Y	Y	Y	N	Y	3	Y	Y	Y	Y	N	
Omni Software	N	Y	N	N	250	1,000	9	N	N	Y	N	N	22	Y	N	N	Y	N	Y	4	N	Y	Y	Y	N
N	Y	N	Y	250	1,000	10	N	N	Y	N	N	25	Y	N	N	Y	Y	N	N	4	N	Y	Y	Y	N
Peachtree	N	Y	Y	Y	Disk	Disk	9	N	N	Y	N	N	25	Y	Y	Y	N	N	N	7	N	N	N	Y	N
Personalized Computers	Y	Y	Y	Y	Disk	Disk	12	N	N	N	N	Y	20	Y	Y	Y	Y	Y	Y	132	Y	Y	N	Y	Y
Quicktax, Ltd.	Y	Y	N	Y	400+	1,000+	10	Y	N	Y	Y	Y	25	N	Y	Y	Y	Y	Y	—	Y	Y	Y	Y	N
Radio Shack	N	N	N	N	100	1,830	10	N	N	N	N	N	20	Y	N	N	Y	N	N	4	N	N	N	Y	N
N	N	N	Y	504	11,420	12	N	N	N	N	N	20	Y	N	N	Y	N	N	4	N	N	N	Y	N	
Y	Y	N	Y	400	4,300	12	N	N	N	N	N	30	Y	Y	Y	N	Y	N	8	Y	Y	Y	Y	Y	
Relational Systems	Y	Y	Y	N	Disk	Disk	9	Y	N	N	N	Y	—	Y	Y	Y	Y	—	Y	—	Y	N	Y	Y	N
Serendipity Systems	—	—	—	—	800	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
Software Technology	Y	Y	Y	Y	500	600	8	Y	Y	Y	N	Y	22	Y	Y	Y	Y	Y	Y	12	Y	Y	Y	Y	N
STR Corporation	Y	Y	Y	Y	2,000	2,000	11	N	N	Y	Y	Y	25	Y	Y	Y	Y	N	Y	3	Y	Y	Y	Y	N
Structured Systems	Y	Y	N	Y	6,000	Disk	13	N	N	Y	Y	N	25	N	N	N	Y	Y	Y	3	Y	Y	Y	Y	N
Systems Plus	N	Y	Y	N	10,000	Disk	12	N	N	N	N	Y	25	Y	N	N	N	N	N	4	N	N	N	Y	N
Y	Y	Y	Y	65,000	65,000	—	N	N	Y	N	Y	30	Y	Y	Y	Y	Y	Y	—	N	Y	Y	Y	Y	
TCS Software	Y	Y	Y	Y	Disk	32,000	10	N	N	N	N	Y	25	Y	Y	Y	Y	N	—	Y	Y	Y	Y	N	
Technico	N	Y	Y	Y	9,000	Disk	14	N	Y	Y	N	N	15	—	Y	Y	Y	Y	Y	5	Y	Y	Y	Y	N
Technology Systems	Y	Y	N	Y	1,000	2,000	8	Y	Y	Y	Y	Y	25	Y	Y	Y	Y	Y	N	4	N	Y	Y	Y	N
TLB Associates	—	Y	N	N	9,999	Disk	12	N	N	N	Y	N	15	Y	Y	Y	Y	N	N	—	N	Y	Y	N	N
Univair, International	N	N	N	N	Disk	Disk	10	N	N	Y	N	N	20	Y	Y	N	Y	N	Y	4	N	Y	N	Y	N
Vadata	Y	Y	N	—	Disk	—	11	Y	N	—	Y	N	—	Y	Y	N	N	N	Y	4	N	Y	N	Y	N

**GL Feature Comparison (continued)**

<b>Company</b>	<b>Address</b>	<b>Comments</b>
Business Applications Software	16755 Littlefield Lane, Los Gatos, CA 95030	Monthly and quarterly P and L, consolidations, job/protect costing, auto backup
Charles Mann	55722 Santa Fe Trail, Yucca Valley, CA 92284	Custom form generator
Complete Business Services	90 W. Center St., Logan, UT 84321	Can print one, all or combination of accounts in G/L, edit transaction @ any point
Compumax Associates	P.O. Box 7239, Menlo Park, CA 94025	Optional cents round-off available, "NOMDA" chart of accounts (preset chart) can set up some special accounts
CPAids	1640 Franklin Ave., Kent, OH 44240	Basically client write-up package
Dakin5 Corporation	7475 Dakin St., Denver, CO 80221	
DASI	2145 NW 10th, Gainesville, FL 32601	Posted from sub-system, auto posting on-line, 99 divisional capability, full direct access (no sequential)
Data Index	4390 Alpha, Dallas, TX 75234	Does not print checks, invoices. Can record several different currencies, has quantity field (cost per unit), multicompny, consolidations
Designer Software	3400 Montrose Blvd. #718, Houston, TX 77006	Set up accounts during entry, flexible report writer
Digital Technology	Box 178590, San Diego, CA 92117	Has CPA package add-on with much more including, tax package, multiple books
Dynamic Microprocessor	545 Fifth Ave., New York, NY 10017	Budget can be installed by user, system is basically a data base and applications
Lifeboat Associates	1650 Third Ave., New York, NY 10028	Edit while making JEs, 99 possible reports, preset chart of accounts, makes ratio analysis, automatic account setup, easy setup
MicroAp, Incorporated	7033 Village Parkway #206, Dublin, CA 94586	Using data base can write any reports necessary, selector data base required
Microed	3910 Bandini St., San Diego, CA 92103	Software creates data base, unlimited report format
Micro Mike's	905 S. Buchanan, Amarillo, TX 79101	Hard disk capability, very easy to use. It does DR/CR automatically
Modern Microcomputers	63 Sudbury Lane, Westbury, NY 11590	CPA write-up package
National Software Marketing	4701 McKinley St., Hollywood, FL 33021	Software customized on request
Occupational Computers	22311 Ventura Blvd. #123, Woodland Hills, CA 91364	Budget module and client write up, 99 different journals, cumulative G/L (yearly ledger)
Omni Software	146 N. Broad St., Griffith, IN 46319	Osborne system, receivables and payables also
Peachtree	3 Corp. Sq. #700, Atlanta, GA 30329	
Personalized Computers	501 S. First, Arcadia, CA 91006	Unlimited report capabilities including footnotes, cover letters, etc.
Quicktax, Ltd.	319 Clawson, Staten Island, NY 10306	Prepares compilation report, unlimited postings in period
Radio Shack	700 One Tandy Center, Fort Worth, TX 96102	Easy to put up Easy to put up, well defined, complete audit trails 7 diskettes (3 diskettes of sample data) complete financial report systems
Relational Systems	5002 Commercial St. SE, Salem, OR 97306	Flexible reports, department incl. statements, multiple clients, comparisons, supporting schedules
Serendipity Systems	419 W. Seneca St., Ithaca, NY 14850	
Software Technology	Box 428, Belmont, MA 02178	300 dealers
STR Corporation	25A Technology Park, Norcross, GA 30092	Can close multidivisions independently, departmental
Structured Systems	5204 Claremont, Oakland, CA 94618	
Systems Plus	1120 San Antonio Rd., Palo Alto, CA 94303	Integrated package Files can be rebuilt in the field, password protection, end users training manual
TCS Software	3209 Fondren Rd., Houston, TX 77063	Complimentary software in development - summer 1982
Technico	9051 Red Branch Rd., Columbia, MD 21045	Dual 16-bit microprocessor, multiple companies, autoload does ratio analysis automatically
Technology Systems	208 Greenwood Ave., Bethel, CT 06081	Comes with preset security code to modify data directly, fast sorting using assembly
TLB Associates	P.O. Box 414, Findlay, OH 45840	Included fixed assets, mail list, P/O, inventory, invoicing
Univair, International	10327 Lambert Int'l Airport, St. Louis, MO 63145	Multiple company I.D. codes, has forecast report
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# DATA BASE MANAGERS: Four for the Apple

by Voyle A. Glover

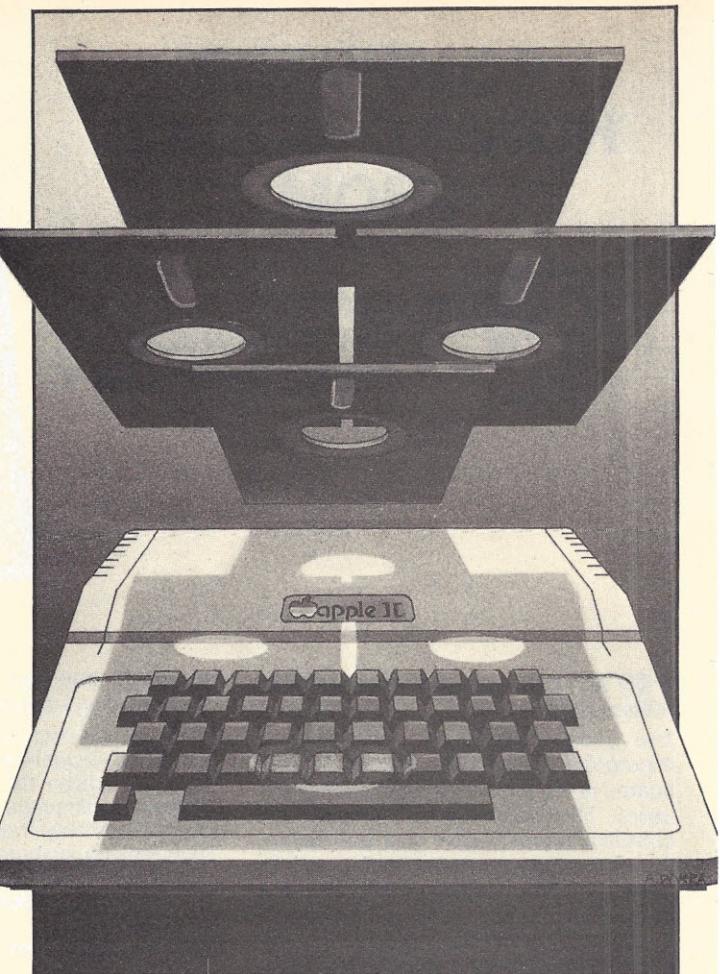
Four popular data base managers (Datadex by Information Unlimited Software, Berkeley, CA; Data Factory by Micro Lab, Highland Park, IL; DB Master by Stoneware Microcomputer Products, San Rafael, CA; and PFS by Software Publishing Corp., Palo Alto, CA) provide an interesting cross section of end-user applications. By examining the essential features of each, we can gain some understanding of the types of functions that a data base manager system can perform, and the consumer can decide which of these four best suits his particular needs.

All four programs run on a 48K Apple, under DOS 3.3, with at least one disk drive, although dual disk drives are suggested for maximum efficiency.

Datadex is the most expensive of the four. For many, needs will not justify the price, and for others, almost no price is too great if it does a particular job well.

The manual comes in a binder, with a master disk and a sample applications disk. You are told that if you send in the warranty card, you will get a back-up program disk. The manual is illustrated with sample "screens," showing what the user will see at a particular stage. This is very useful. Even more helpful is the sample applications disk. There are nine files ranging from a People file, to Elements, and even TV Special—a cartoon-like file. The manual is divided into 12 chapters.

A brochure is included, containing all the commands. It is only through use that one can use the program with any measure of ease, but the commands are not difficult to learn or apply. They are grouped under five headings, with commands working within more than one group. The headings are: Main Menu, Disk Find, Create Reports, Enter Data and Create Files. The commands are typically a Control (CTRL) plus a letter, such as



within Enter Data, CTRL A will move the cursor to the previous field of your record, or a CTRL X to go to the last record of an "extent" of a file. (Extents denote the amount of records main memory will hold. Thus, you might have 50 or more within a particular file.)

When you create a file, the program allows the user to grab a portion of the display created and move it around on the screen, until satisfied with the position. This is totally unique; I used it often.

You can print a copy of the screen and records can be printed in report fashion (where you have specified the form) or as they appear on the screen.

There are nine fields possible for a record. (A field is an allocated space for something in your record, such as nine spaces for a zip code.) They are: Text, Integer, Floating Point (up to nine digits), Date (MM/DD/19YY or MM/DD, or MM/DD/YYYY), Phone (with or without prefix), Clock (if you have one in your Apple), Social Security number and the nine-digit zip. When creating a file, you can place titles anywhere on the screen, vertically or horizontally. These are called Comments and you are allowed 21 of them. The more room you take up on the screen with comments, the less room you have for fields. This is important, and I would have liked to have seen a second page for more fields.

When you load up the program, you will see the main menu, giving you five displayed options and one option at the bottom line that is not clearly understood unless you've read the manual. This is the Utility choice; you will use it to do any creating. So a press of the numeral "1" presents another menu, giving you the choices of

creating files or reports, sorting or initializing a diskette, or reconfiguring for a clock board or a different printer.

Perhaps you need a blank diskette, so you choose to initialize. After the program is ready, you are told to insert the blank diskette. If the diskette is not blank, the program will stop and tell you it is not blank and ask you if you want to proceed. Once you have this done, you will want to create a file. After this is loaded (in a few seconds), you will then have a choice of either altering a previous file (in our case there are none), or creating a new file. Choosing to create a new file will give you a blank screen with the cursor in the center. If you are familiar with EasyWriter (from the same manufacturer), the commands for moving the cursor around will be familiar, for they are the same. CTRL W, for example, moves the cursor up.

### Typing a comment

After you have the cursor where you want it, you may want to type a header (comment). This is shown in reverse video until you press Return. Whenever you want to place a field on the screen, you will enter the command for the particular kind of field you want (text, integer, phone, date, etc.), and if it is a text or numerical field, you will be asked how many spaces to allot, up to the maximum width of the screen. This will depend upon whether you placed a comment/title at the beginning of the field or over it. If it is at the beginning, you will be allowed only 36 spaces minus the spaces taken by the comment/title.

Once the form for your record is built and you have grabbed titles and fields and moved them about to your satisfaction, save it. You will give it a starting extent number and a name. Thereafter, when doing searches, sorts, report creations or just entering data, you will use that name and extent number. When an extent is full, or if you want to put information in another extent (say for February), you simply assign a number to the extent. The file name remains the same. For example; you could have a Birthday file with 12 extents—one for each month of year.

I found the program very easy to use, with perhaps an exception being the report creations. There were not enough clear examples here, and I found myself floundering too often.

The file creation portion is more than satisfactory. It is nice to design your own "data card"—and it is very easy. There are many kinds of files that can be created and adapted. Some that I made up included: Check File, a fill-in-the-blanks file that gave all information about a check, including account number, and totals and subtotals for different accounts; People, a name-address file; Writing Ideas (ideas for articles, stories and novels); and Family/Medical, containing all illnesses, treatment, costs, dates, doctors, symptoms of a family.

I feel very comfortable with this program. Although many features cannot be mentioned due to space limitations, it is a worthwhile product. Retail price is \$295.

Data Factory is one of the most powerful data base managers available for micros. It is a compact, well documented package with two diskettes. While the original program runs on DOS 3.2, this one runs on 3.3.

My biggest criticism with the program concerns documentation. The manual is straight text, with few examples, and no screen samples. But it is normally not difficult to follow the directions, and the program itself

assists you with questions. Some of the questions are so terse as to create more questions rather than leading the user, but you quickly learn what is meant by doing the wrong thing. The new manual is much improved from the old version.

The program is almost entirely menu driven. This is a desirable feature, offsetting any deficiencies in the manual. There are a few CTRL commands. If you want to do anything with your data, either sorting, entering or replacing it, you will select that function from a menu, and that module will be loaded into memory from the program disk.

To create a new file, you will start the program with the master in Drive #1. The program will ask whether you are using a two disk system, then will ask you to insert a data disk. If it is not a 3.3 disk, the program will tell you. A press of the I key will initialize the diskette. You will then be asked whether you want to initialize a new file. Here is one example of a question that raises questions. When you are a novice you understand the word "initialize" only in the context of creating a new disk and erasing everything else. The word "create" would have been more appropriate.

One of the handiest features is the Construct and Append section. It allows you to "change your mind" (a direct quote from the manual). You may add up to 10 new fields each time you run this module, or decrease the number of fields, change field lengths or positions and append records to the file by blocks (i.e., records 10-20, 30-50).

You may wish to know how much disk space you have left. There is a module for that, or you might want to know how many records a particular file will hold in main memory.

Searching is easy and menu driven. You can search fields in multiple levels (up to 20). In other words, you might want to find all salesmen with sales over \$20,000, working in District 1, under a particular account, selling a particular product, etc. The level of search is handy and allows the user to select exactly the records he needs, and no others.

As a member of a local labor union who purchased the original Data Factory, I entered over 3,500 names, addresses and other related data into a file and the experience allowed me to become quite familiar with the program. The new program has corrected most of the problems I encountered, and is much improved. While the new program is more powerful, my experience on the original made it easy to incorporate the changes.

### Think carefully before designing

It pays to sit down and think carefully about exactly what you want in a file and design it to care for every need. When I started, for instance, I did not use a last name field. Thus, when I wanted to do a sort (several hundred names later), I was dismayed to see everyone in perfect alphabetical order—for the first names only.

When you start a new file, after it loads up the program will ask for a file name (28 characters max). Then you will be asked how many fields—up to 88. Each field may contain up to 239 characters. The screen then asks you the length of field one, then the name. This process continues through the number of fields given. Finally, the screen will display your fields with names and length, and at the bottom will give you the option of correcting any or all of the fields, or starting

over again. Finally, you are asked to give the longest field you will sort or search. You must take care here, for this has a direct relationship on how many records you can hold in memory. You are told, rather casually in the manual to "Always enter a number higher than 9."

The program is very functional, practical, easy to understand and powerful. Sorting speed is about four minutes per 350 names and addresses and searches are quick and easy. The many modules make this program very useful for anyone with business applications, or where there is a bulk of information. The Replace module, for instance, makes it worthwhile for the union. Using this, one can change many records at once, with the same data placed in all records, or all records with a particular entry. The union can do the dues checkoff by entering those members who have not paid, and then placing a "paid" in the field for all others. Thus, if there are 56 non-payments in February, all the secretary has to do is enter an asterisk in a field for those individuals. Then, by telling the program, she can have Paid entered into the February field of all the rest. Later, after sorting them, she can have the program print out all names with an asterisk.

The program is recommended to anyone who needs a powerful data manager. It will do standard math functions, so adding within records or between fields is a possibility, making it possible to use the program as a check or budget file. Retail price is \$150.

The DB Master manual consists mostly of straight textual matter, with a few flowchart type illustrations and some sample screen illustrations. There is only one diskette provided, and if that is damaged or destroyed, a replacement is offered for \$15. There is a lot to absorb with the manual; the user should read it carefully and not be in a rush to get the program running. The DOS 3.3 PROMs *must* be installed in order for the program to boot.

#### Reset protector provided

The manual indicates that a "reset" protector, a rubber "O" ring, is provided with each program. This is a very handy little item, one that has saved me from disaster occasionally.

The program is mostly menu driven; that is, the commands are listed on screen within a particular chore or task and you are able to choose (usually by number) the task or function you wish to perform. There are some Control sequences, but not many.

The program is set up around primary and secondary key fields. These are the fields on which you will

ordinarily do your sorting or searching. But you are not limited to searches. The fields possible are standard, except that there is an auto-date field. This choice will automatically fill in with the present date in the Add Records mode. Also, you may have computed fields —those that you have set up to perform some math function, usually field to field. The manual in this section could have been clearer, although I eventually did everything correctly.

One feature that is especially attractive is the Default function. While the other three programs have such a function, only this one allows the user to establish his

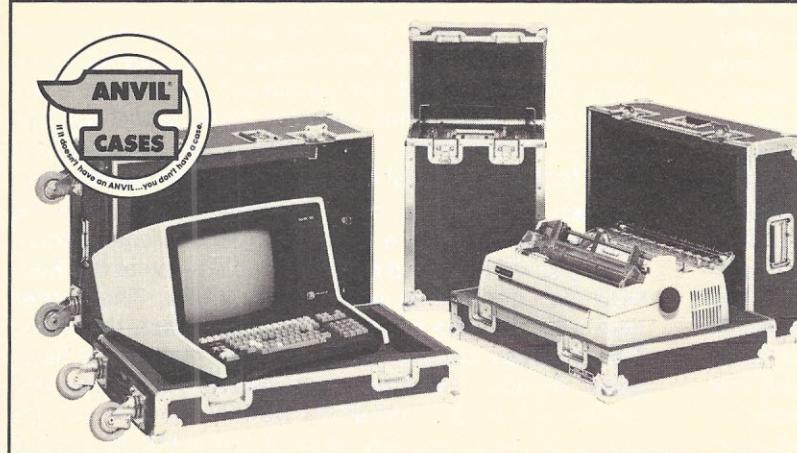
## One feature that is especially attractive is the Default function.

particular default, then allows him to change that default temporarily (at one sitting, for instance). Typical applications might include information that occurs with enough frequency to justify having that default value already entered, as this saves much time and effort.

There is a Totals feature that gives you a running summary of all records that you want to find matching certain criteria. It will give you the count (# of records matching your criteria), sum (total of values found in the fields), average (sum divided by count) and the standard deviation (measure of how far the individual values deviate from the mean).

Creating a file is simple enough, but one should use caution, especially where the primary key is concerned. I found that it is best to use the sheets of special graph paper to lay out your screen form first. After you have entered the program and established the master password, you will be asked whether you want to protect the file with "read only" and/or "write and read" passwords. You must have two blank (or erasable) diskettes ready. The program will initialize these for you if necessary.

You will first be asked to enter your primary fields. You are not allowed computed fields or an auto-date field here, and you are limited to 10 fields and 35 bytes (assume 35 characters). Also, you must make sure that



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every key (all fields considered together as the primary key) is unique. That is, every record must have some variation of information within the fields that comprise the primary key. For example, if you had two fields as a primary key, and you had Jim Jones as a name in field one in two records, field two must reflect a difference somehow. If the second field was "Relationship" and both were "friends," you would have to put in something like "friend 1" and in the other record "friend 2." This is not difficult; it's worth mentioning here only to make the potential user aware that some thought should go into the creation of his file. It is wise to create at least one field that will enable you to ensure that the record is unique. If you do happen to put a record in that is a duplicate (in the primary key), the program should warn you.

You may send the screen contents to the printer for hardcopy using a CTRL P. Setting up a report format was a bit confusing and a bit understated in the manual, but DB Master does a better job in this regard than DataDex or Data Factory.

The potential for a wide range of applications exists in this program. I would like to see the manufacturer go one step further with this and make it usable with the popular 80-column boards. A suggestion to make the program complete is to make it compatible with a popular word processor. It would be nice to go into a report, pick out items within that report and designate them for inclusion into a particular file without having to type the information twice, or to take information from a file and throw it into a text file, much like form letter programs do. But it is a good program as is; its flaws are minor. Retail price is \$229.

### **Personal Filing and Report System is best**

The packaging of the Personal Filing and Report System is the best and most professional looking. The system comes in two unique boxes containing manuals and diskettes. There are two diskettes in the Report box: one entitled Sortwork, and the other Report. In the other box containing the data base manager program, there are also two diskettes. One is the courtesy blank diskette, and the other is the program diskette, labeled PFS. In order to do any sorting with the Report portion, you must have dual drives.

One gets the impression right away that things are not going to be difficult upon looking at the manual. When so much care is taken with the packaging, one assumes such care will be taken with the most important part of the package, the program itself. It was.

There is one main menu that can be called almost any time using the ESC key. Like Data Factory and DB Master, this program is menu driven, but uses some CTRL key functions as well. They are easy to learn and are few in number.

The main menu gives you six choices: Create File; Add Form; Copy File; Search; Print; and Remove. The Report menu will give three choices: print a report; pre-define a report; and set new headings. This is fairly standard, and easy to understand. What makes it even easier is the manual, which gives sample screens at almost every step.

### **Program use simple, but with limitations**

Using the program is quite simple. While it is not as sophisticated as the others, and there are some limitations (such as file names of only eight characters or less), they are overcome by the ease of use, the clarity of the manual, and the simplicity of design.

Every file is on a single diskette and the user is told in the manual that 1,000 pages (meaning screen pages) can be stored on a diskette. Creating a file means little more effort than inserting the diskette and following instructions in the manual and on the screen. You are guided every step of the way, and it is possible to create a file without ever having looked at the manual.

Adding information into the records is easy. After choosing #2 (Add Form), you will get a blank form on the screen, with the headers or titles you've given to each field shown in reverse video. You fill in the form and if there are more pages to the form than one, you hit CTRL N and the next page is shown. If you designed the form with only one page, but for a particular record you need to add some comment or information, you can request an additional page with the CTRL N sequence. A blank page will appear with the word Attachment in the upper left corner in reverse video.

Printing out reports is as easy and functional as the rest of the program selections. You can have the report printed alphabetically or in a numerical order, up to 132 columns wide. You can do math functions within and on up to three columns (called derived columns). A CTRL A will allow you to view a report that is wider than 40 columns. Retail price for the Personal Filing and Report System is \$95 each.

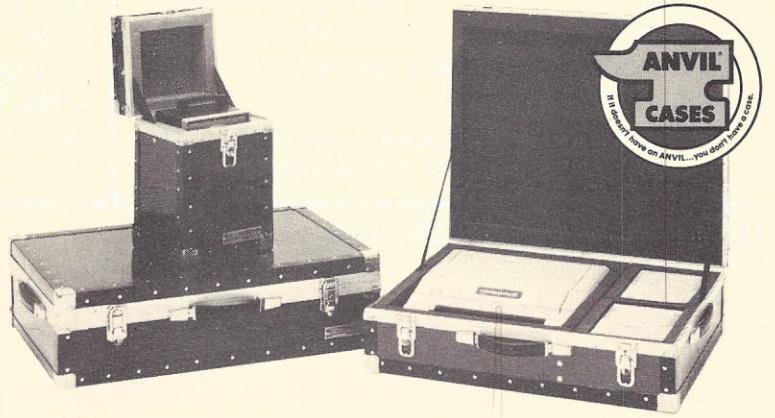
It is hard to choose one of the four programs as best, because there are attractive features about each—things that make each one unique. The user is advised to analyze his specific application areas in order to make the most suitable choice. □

## **Quick Getaway.**

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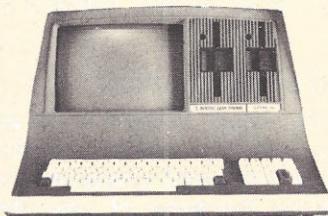
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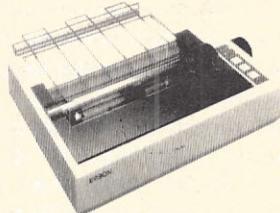
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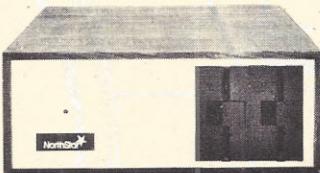
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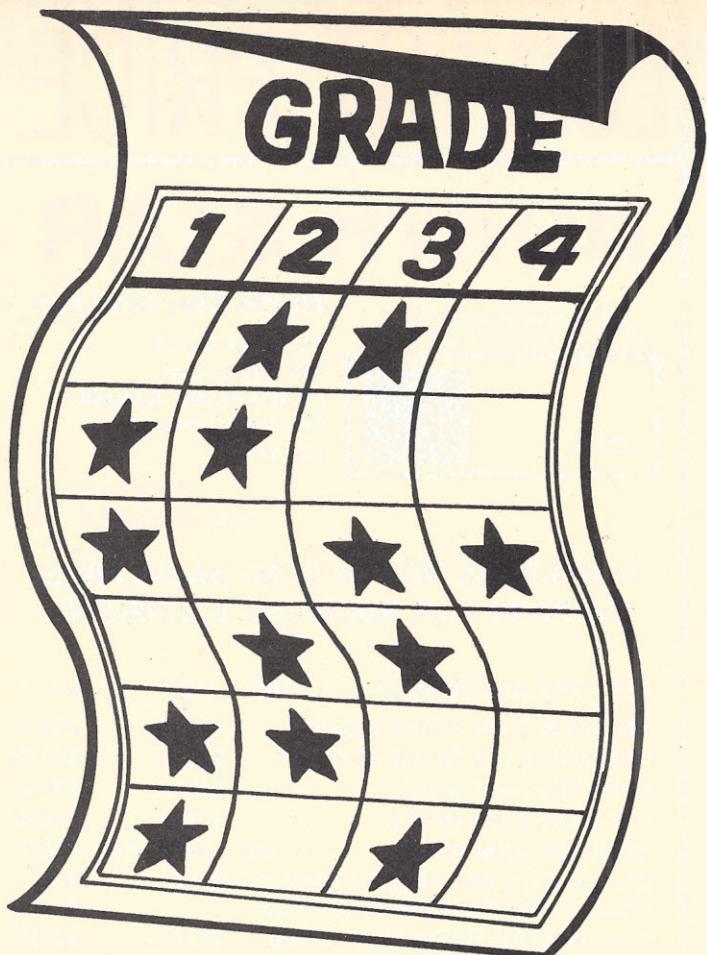
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# CALCSTAR: Good Grades for Flexibility

by Rocky Smolin

I love VisiCalc (Personal Software, Sunnyvale, CA). That puts me in a big crowd. As soon as I saw it, I knew it was the greatest software idea since the data base. It has fired the imagination of everyone I have shown it to, regardless of how little they have known about computers. Even though it had a few shortcomings, I put it to work for me at once, and have relied on it ever since.

Of course, every good program encourages imitators, and, hopefully, new generations of improved, enhanced, speedier, friendlier versions. This is exactly what has happened to VisiCalc. One of the latest to hit the marketplace is a program called CalcStar, marketed by MicroPro (San Rafael, CA). I have only worked with the first version of VisiCalc, so my impressions of CalcStar were formed in comparison to that.



```
*****-Cursor Movement-| -Commands- ; followed by | -Misc- *
* <CR> Right |A Auto F Format L Load R Recalc * Extend |@ Curs Pos *
* ^S Left ^D Right |C Copy G Goto M Merge S Save = Lock ? Evaluate *
* ^E Up ^X Down |D Delete H Help O Order W What ? Space ^ Data Togl *
* ^Z Col A next row |E Edge I Insert P Print <TAB> Goto |<ESC>Cancel *
*Col> |A |B |C |D |
*Row+-----+
* 1:> <
* 2:
* 3:
* 4:
* 5:
* 6:
* 7:
* 8:
* 9:
* 10:
* +
* cursor: A1 current: A1
*
* current|| type:
* data || contents:
* edit:
* +-----+
```

Figure 1. Main menu

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These financial-planning products are essentially electronic worksheets. The user defines the column and/or row titles and contents, and can easily change the contents of any position or cell on the worksheet. In addition, the user can define the contents of a given position on the worksheet as a function of some other position. Thus, a worksheet containing an income statement might define the contents of the cell representing net income as the contents of the cell containing net revenues minus the contents of the cell containing net expenses.

Further, since net income is defined as a function of revenue minus expense, any change to either of those figures will automatically change the net income figure. So it's easy to play 'what if' games with your worksheets, adjusting revenues and expenses to see what the effect is on income. An additional powerful feature of these programs is the ability to copy or replicate some value or values down a column or across a row. Thus, after lining up this year's income statement in column 1 of a worksheet, you could easily extend every one of the revenue and expense lines into the next five columns, increasing each figure by 10% over the previous column. Instantly, you'd have a five year pro forma projection of your income statement, based on the assumption that both revenues and expense items will increase 10% each year.

The possibilities are unlimited: financial statements, inventory tracking, investment management—any task where you would normally write columns or rows of figures down on paper.

For its manual, CalcStar gets a strong B. Although the style is conventional, and consists almost entirely

of tutorial, the type is single-spaced, giving each page a dense and intimidating textbook-like appearance.

However, the contents are very well-written. A minimum of technical talk, and thorough instructions on the use of each program feature, make this manual worth emulating. Fortunately, the operation and application of the program is fairly simple, so that about four or five

## **These financial-planning products are essentially electronic worksheets**

hours of diligent study are enough to get all the way through CalcStar's various features.

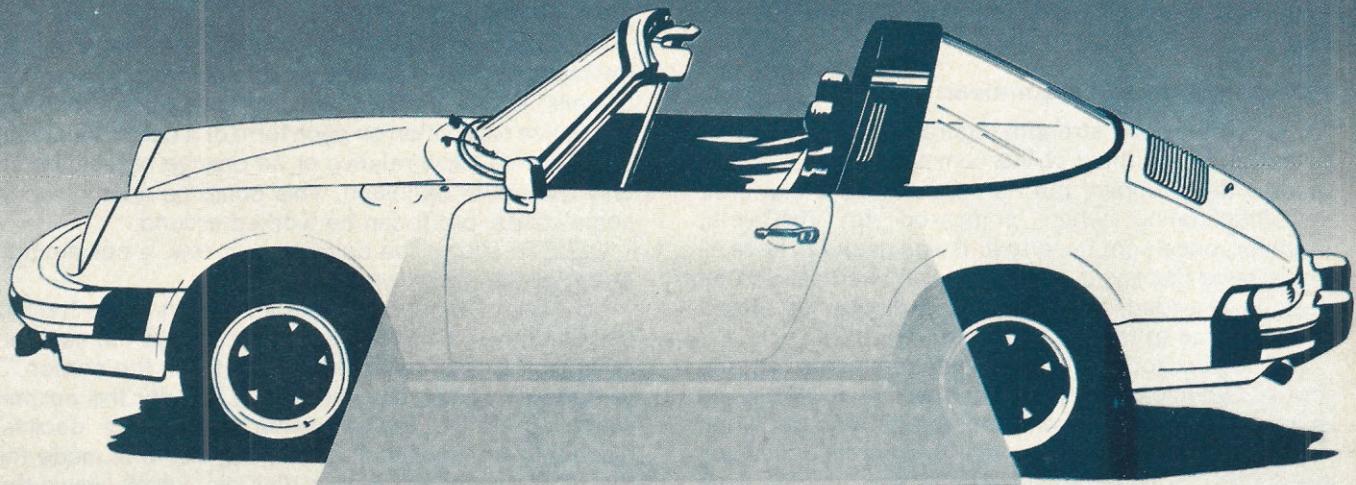
Like all software running under CP/M, CalcStar can be used on a wide variety of terminals, each with its own unique characteristics and control codes. It becomes necessary, then, for the vendors of CP/M software to find a way for users to easily configure the canned package to their particular video display.

MicroPro has implemented a nearly ideal solution to this problem. After a few words of introduction, the user is directed to Appendix D in the manual, which instructs one to run a program called INSTCS. This program displays a list of 26 different terminals. One

*Col> A	B	C	D	
*Row1				
* 1:>	<			*
* 2:				*
* 3:	PART #	PART NAME	SUPPLIER #	*
* 4:				*
* 5:				*
* 6:	12345	1/4" BOLT	35	*
* 7:	12346	3/8" BOLT	35	*
* 8:	12347	1/2" BOLT	35	*
* 9:	12348	5/8" BOLT	83	*
* 10:	12349	3/4" BOLT	83	*
* 11:	12350	7/8" BOLT	83	*
* 12:	12351	1" BOLT	83	*
* 13:	12353	1 1/4" BOLT	35	*
* 14:				*
* 15:				*
* +				*
* [ EXAMPLE] cursor: A1		current: A1	L-R	*
* current   type:				*
* data    contents:				*
* edit:				*
* CalcStar (c) 1981 c/o MicroPro Int'l CS9999xx rv_A01 [LSI ADM-3A]				*

Figure 2. Alternate screen mask

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simply picks the terminal one is using and CalcStar installs itself. If your terminal is not listed, the program prompts you for the codes it requires. In either case, the prompts are well-written and the program is as near foolproof as possible.

The introduction tells you correctly to run the program called CS. It also gives you an eight-page summary of the operation of CalcStar—good for someone familiar with VisiCalc or one of its cousins, impossible for the first time user. If one turns directly to another introduction following the table of contents, one is instructed to execute CalcStar, which is not on the disk. It has been renamed CS, but the manual has not been updated. For those unfamiliar with computers or CP/M, this would stop them cold.

### Most commands in main menu

The main menu's strength (figure 1) is also its weakness. It contains most of the commands one needs to operate the program, but its appearance is cluttered and intimidating when compared to VisiCalc's. However, once I got used to it, it was useful to have all these items displayed. In addition, an alternate screen mask is provided, which allows a display of fifteen rows, instead of the standard ten (figure 2).

In addition to the operational reminders on the screen, additional help information is available by keying ';H'. Figures 3 and 4 show what you get when you ask for this help. The cursor is controlled by using the <CTRL> key and the diamond formed by the keys E, D, X and S. Data entry is simple enough, and the ability to left, right, or center-justify your text makes for nice looking reports.

All the commands worked as they should have. The keystrokes for initiating various functions are not particularly obvious, but (as with all mnemonic codes) once they're learned, they become automatic. At that point, the ability to execute the desired command with a minimum of keystrokes becomes a big plus. Following are descriptions of each command.

AUTO is used to edit entries that are subject to frequent changes. One first flags those entries one would like to edit frequently. Then, when the Auto mode is turned on, the cursor automatically jumps from one flagged cell to another, saving the user the trouble of hunting around the worksheet for the values that need altering.

COPY allows you to copy or replicate the values or definitions in one cell or range of cells to another range of cells. Unlike VisiCalc, which allows either constant or relative replication on each term of a cell's definition, CalcStar will allow relative or no change replication on only the entire definition. This could be a handicap in some cases, but it can be worked around.

DELETE allows the deletion of a row, a column and entry, or the entire worksheet.

EDGE sets the current cursor position to the top left corner of the display window, and displays the next ten rows, and all the columns that will fit on the screen.

FORMAT allows the user to: 1) specify the column width; 2) define the precision (number of decimal places) to be displayed; and 3) set the form mode for the AUTO command. Unlike VisiCalc, which allows the column width to be defined only once for all the columns in the array, CalcStar allows different column widths to be defined for each column. The precision

```
*****  
*  
* — Help page 2 — Hit <RETURN> to continue  
* _____ Extended commands _____  
*  
* these commands are accessed by hitting the ';' key  
* Auto enter Automatic entry mode. <ESC> will abort.  
* Copy Copy a (range) entry to another (range) entry  
* Delete Delete a row, column, entry or the whole array  
* Edge set the window top left corner to the cursor position  
* Format change column size or precision under cursor  
* Goto move cursor to a specific column and row  
* Help display this information  
* Insert Insert a row or column into the array  
* Load Load a file into the array  
* Merge overlay file onto array  
* Order Change the evaluation (column/row) order of the array  
* Print Print a report  
* Quit exit the report generator  
* Recalculate recompute entry at cursor or whole array in current order  
* Save Save the array to a file  
* What if text, prints 1st column & row entries of cursor position  
* ? print approximate storage space in terms of entries  
* = lock column A and row 1 onto display  
* * Switch between 10 (with menu) and 15 row screen display  
*  
*****
```

Figure 3. Help information

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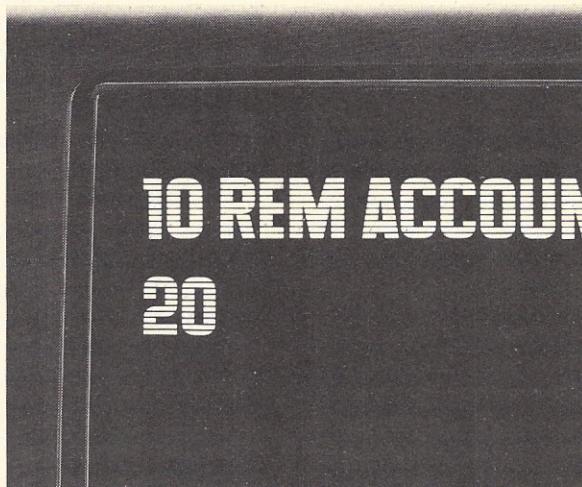
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definition worked, but the rounding that showed in the manual did not work on the screen. In other words, a number like 1.58 was displayed as 1.5, when the precision was set to 1, instead of 1.6.

GOTO allows the user to move the cursor directly to the desired cell. The TAB key performs the same function.

INSERT allows the user to insert a row or column anywhere on the worksheet, moving the remaining entries down or to the right, and adjusting the cell definitions accordingly.

LOAD loads a file from disk into memory. A nice feature here is the ability to specify the starting location of the array. Thus if you had originally keyed figures into columns 1-5, you could load this same data into columns 6-10, if you liked.

MERGE allows you to load a disk file into the worksheet, overlaying the current contents of the worksheet's cells, but leaving other cells outside of the merge file's boundaries untouched. By judicious use of the load and merge commands, one can get quite creative in the piecemeal assembly of complex worksheets.

ORDER changes the evaluation order of the array, either column/row or row/column. This feature is useful and even necessary in some cases. As the recalculate command moves through the sheet in its usual order of evaluation (left-to-right, top-to-bottom), it may encounter a formula in a cell that depends on a value in a cell that has not yet been evaluated, so that the result would be incorrect.

PRINT requires one to respond to several prompts, which provide lots of flexibility in specifying the format of the output. In addition to specifying the top-left and bottom-right corners of the area to be printed, CalcStar

allows the user to print to a disk file. The form length and width can be specified, as well as the ability to pause between pages. Finally, one can set a switch to print the column headings on the top of the page, whether or not one is printing from the top of the sheet.

QUIT exits CalcStar to the CP/M operating system.

RECALCULATE triggers the recalculation of either the entry at the cursor's current position or the entire worksheet. The true power of electronic worksheet products lies in this ability—to modify one or more entries, then to quickly recalculate all other entries that are functions of the altered values.

SAVE keeps the worksheet on the disk under a file name specified by the user.

? tells the user how many more entries can be added to the current worksheet based on the amount of memory available.

= locks the first row and first column onto the screen. Since this is where you are most likely to have entered column or row descriptions (no matter where the cursor is moved in the array), these descriptions always show on the screen.

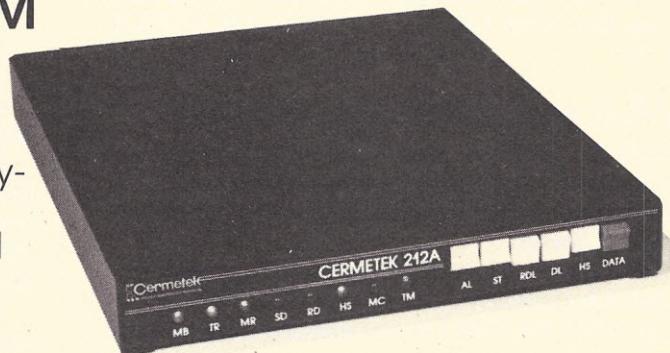
Given the applications of a program like this, there are several common operations that one can expect to be required to perform, such as adding up a column of figures, counting the number of entries in a list, taking averages, etc. These functions are built into CalcStar and can be invoked simply by including them in a cell's definition. Consider the expression '+ SUM (C5>C20)'. The sum of all the numerical values in rows 5 -20 of column C would be placed in that cell's definition. If one of those values is altered and the recalculate command invoked, the cell containing the sum would automatically

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```
*****
* — Help page 1 — hit <RETURN> to continue
* Main entry mode
* Cursor is controlled with keys E, D, X, and S with the <CTRL> key held down.
* Direction is up, right, down, and left in that order. (Control Diamond)
* <RETURN> moves the cursor right if no data has just been typed.
* <CTRL> Z moves the cursor to the next row, first column.
*
* Data Entry: digits 0-9, +, - signal numeric entry.
* alphabetic characters or blank signal text entry.
* /, followed by R, C, or L justifies text right, centered, or left
* ^ is used to switch between text and numeric if needed.
* /= duplicates entry across column. /P causes page break for print
* ! sets special entry mode for arithmetic modification of input.
*
* Equations may contain numeric data, cell references, and functions.
* four-function arithmetic (+,-,*,/) may be used with any of these.
* @ refers to current cell location. Type one character and then
* move cursor to put in cell references without typing them.
* ! following a cell reference holds it constant in relative copy
* functions include: sum, avg, cnt, abs, exp, log, ln, min, max,
* sqrt, regr, slope, proj, depd.
*
*****
```

**Figure 4. More help information**

be modified to reflect the new sum. In addition to the SUM, CalcStar has other built-in functions:

- CNT —the number of numeric items in a given range
- AVG —the mean value (SUM/CNT)
- MAX —the maximum value in the list
- MIN —the minimum value in the list
- SQRT —the square root
- LOG —the base 10 logarithm
- LN —natural logarithm
- ABS —absolute value
- EXP —exponent

Four additional built-in functions allow the user to perform linear regression type forecasting on a set of figures—one of the most powerful features of this package, and one of the most useful functions of any CalcStar-type product.

REGR performs linear regression on ranges of specified independent and dependent variables.

PROJ allows the entry of a value for an independent variable and calculation of the best estimate of the dependent variable.

DEPD allows entry of a value for a dependent variable and calculation of the best estimate of the independent variable.

SLOPE has the system enter the slope of the linear equation computed from the regression function.

The biggest advance over the original VisiCalc in this package is the ability to define the contents of a cell not just as a function of one or more other cells, but also to invoke 'if...then...else' logic in the definition. Thus you could say the equivalent of "if the value of net income is greater than some amount set tax rate equal to 25%, else set it equal to 15%". This 'if...then'

capability greatly extends the usefulness and application of the program.

You can create outputs from CalcStar that can be used by Basic, DataStar, WordStar, MailMerge, and SuperSort, greatly extending the usefulness not only of CalcStar, but also other MicroPro products.

Being used to VisiCalc, I found the slow speed of CalcStar's display to be its biggest drawback. In addition, when one moves the cursor off the screen, instead of rolling the data, CalcStar re-displays the entire screen, making it awkward to scroll through the data sheet.

The smaller size of the display window was also a drawback in this reviewer's mind. The worksheet, regardless of the amount of memory available is limited to 127 columns and 255 rows. I also missed the ability to invoke operating system functions like directory listings from within the program.

Finally, the index in the manual, which was not as complete as it could be, referred one to the section number (i.e. II.16 for section 2, topic 16), instead of page number. This caused a lot of extra page turning when trying to locate the write-up of a particular topic in the manual.

Overall, CalcStar gets good grades simply for working as advertised. A lot of software on the market today fails to meet this test. Although slow in a few functions, the program is quite flexible and complete. With the addition of the linear regression forecasting, it is a very powerful program in its genre. For those who have one or more of MicroPro's compatible packages, CalcStar would probably be the program to choose. Its interfacing ability makes it a much more powerful program than it first appears to be. □

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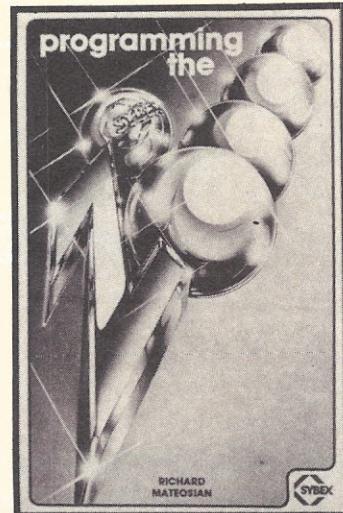
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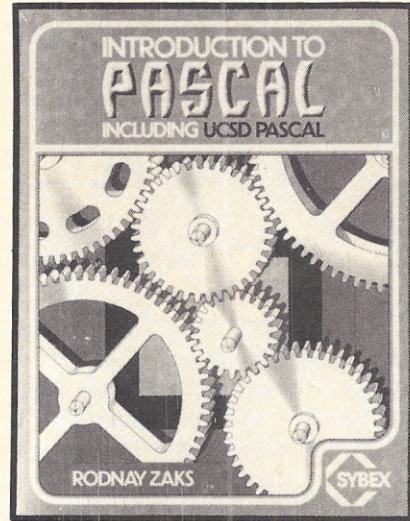
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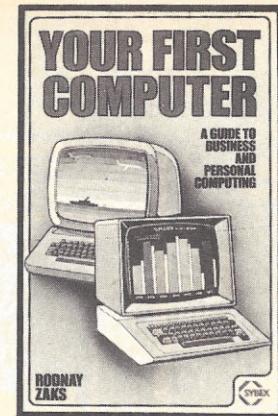
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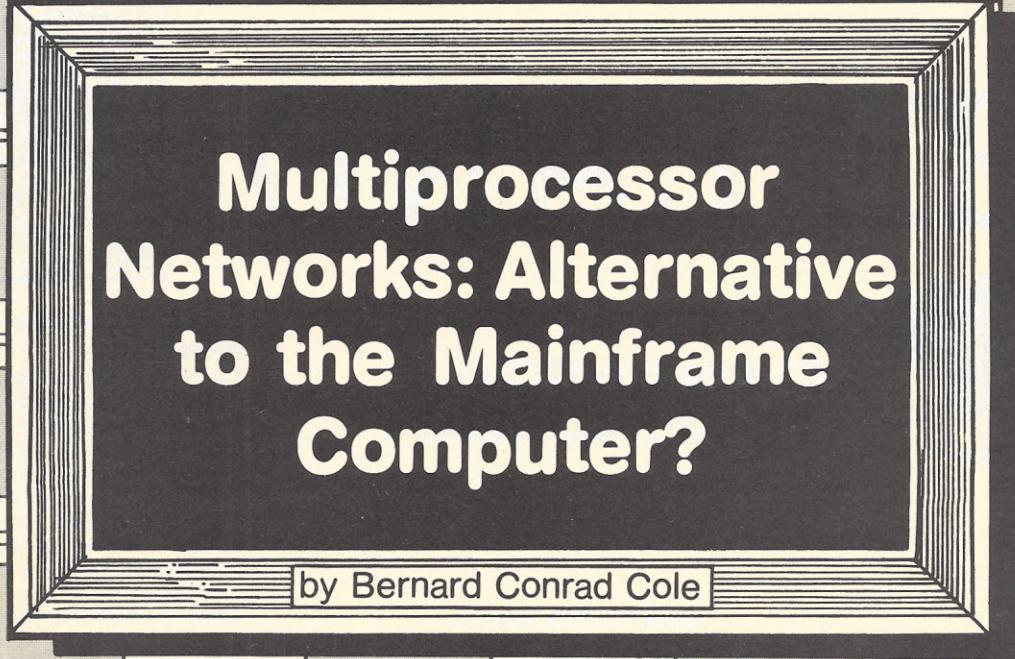
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# Multiprocessor Networks: Alternative to the Mainframe Computer?

by Bernard Conrad Cole

With the emergence of various local area networking schemes, it is already clear that numerous computers can be hooked together to share not only expensive peripherals, but also tasks previously requiring a mini-computer. Before too long, it should be possible to build networks of microcomputers that will be powerful enough to actually replace the so-called mainframe computers in many applications. The mainframe computers will not disappear. There are numerous problems that require the raw number crunching power of a mainframe, such as scientific and engineering applications.

However, most of the problems facing business users of mainframes are not of this type and could be performed by a network of small computers, each working on separate parts of a problem in parallel. This three-part series will survey the pros and cons of multiprocessor systems.

Cost, until recently, has been the major deterrent to such systems, since the collection of small computers necessary to equal the capability has been more expensive. However, microprocessor and memory technology has evolved to the point that the availability of low cost computing power presents an increasingly attractive alternative to mainframes for many computing tasks.

For such multiple microprocessor-based systems to adequately perform many of the functions now performed by uniprocessor-oriented mainframes, sufficient intelligence must exist in the personal computers being used at each node.

With the use of advanced microprocessors that can access up to 16M bytes of memory directly, small computers are now becoming available that can directly access all the memory in the local dispersed processing network, without interfacing to a mainframe CPU. In a typical business application requiring 50 nodes, each with 256K bytes of memory, the local network would have 12.8M bytes available, much within the capability of these processors.

Most of the present generation of personal computers—based on eight-bit processors such as the Z80, 8080, 6800 and 6504—are not adequate to serve as nodes in such multiprocessor networks. But such small systems as IBM's 8088-based Personal Computer and the 6800-based Apple III have the necessary computing power and memory capacity (256K bytes in most cases).

With small systems of sufficient power, there are a number of alternatives to present multiprocessor distributed processing schemes, where the architecture

and software is so structured that each node has access only to its own local memory. (If it requires additional memory, it has only recourse to the mainframe CPU.)

One alternative structure is a dispersed processing scheme, wherein intelligent nodes are configured so that they can draw on the memory resources of all the others. In this approach, even if a node has only "x" amount of RAM internally, it can draw on 2x, 3x or 10x, if required for some specific application. This can be done by configuring the system memory so that it is stacked in 2,3 or 10 blocks. This approach requires the development of new software to solve the problems of contention and the use of new CPU architectures capable of accessing several tens of megabytes of memory directly.

A possible compromise to these two alternatives is a multiprocessor scheme with common memory. In this approach, each node still has access only to its own local memory. But for additional external storage locally, one of the nodes has the additional function as the repository for extra memory. An ordinary intelligent node with soft disk capability can be adapted easily to hard disk to handle such a job.

### Mainframe pros and cons

The advantages of working with existing mainframe CPUs are well known. Large software libraries are available and manpower may be more readily available. A mainframe's multi-programmed operating system allows shared computer usage. However, these advantages have to be weighed against a number of negative factors, which make mainframes an expensive approach in many applications.

Usually, a mainframe is designed for a variety of applications and is capable of supporting timesharing, batch operations and real time transactions concurrently. Operating systems must provide all these capabilities. Expensive hardware resources must be efficiently used, while at the same time protecting individual users. This creates a processing overhead that can be a particularly heavy load to bear in some applications. In addition, restart and recovery procedures have to be general enough to serve a large user base. A typical operating system may require 300K bytes of core storage, making the mainframe large and expensive, creating a mismatch between the computing power required and what is available.

Many computing problems are more demanding of file access than of CPU time. A large, powerful mainframe with large word sizes, fast CPU cycles and sophisticated instructions often represents overkill. A smaller, less expensive system with adequate files is often just as effective a solution—at a lower cost.

Many computer facilities consist of single expensive mainframes, since high cost prohibits the procurement of a second computer for backup. In this environment, jobs with high availability requirements suffer. For when the mainframe fails, the job remains idle until the CPU is fixed. A second reliability problem is the sheer complexity of the operating system. Few large operating systems and data base management systems are completely defect-free, so a large computer installation may crash more often due to software rather than hardware failures.

A centralized computing operation often is unresponsive to particular user needs. This may be caused by

such things as procedures that are designed to "globally" optimize the central facility, an overload facility or ineffective management.

Many mainframe CPUs have long or unpredictable response times for real time applications. This is usually caused by the overhead of the operating system and the data base management system, and contention for resources with other nonrelated users.

If care is taken in design, it appears that the multi-processor approach, taking advantage of recent advances in semiconductor technology, can alleviate many of the problems incurred by mainframe uniprocessors.

Reliability is increased, since redundancy can be achieved in a relatively inexpensive manner. Unlike the mainframe approach, the entire system need not be duplicated—just those portions that meet the user's particular reliability requirements. In addition, simpler, more reliable software can be incorporated. A multiple microprocessor-based approach can also be more responsive, because the system can be closely tailored to a particular application. Additional processors can be provided, as needed, to ensure proper response time.

A properly-designed multiprocessor, moreover, when threatened by overload can be expanded incrementally at low cost by the simple addition of more processors. Such a system, because of its modularity, is much more cost-effective than a mainframe, because it can be configured to meet the needs of any type of environment—a small number of processors for a small site and a large number for a large site.

Although the concept of a multiprocessor is not new, the concept of implementing such a scheme using microprocessors is. In the 1960s, conventional, relatively expensive mainframe CPUs were linked, making it expensive to have more than a few processors. More recently, multiprocessors using minicomputers have been implemented, and configurations now exist with as many as 15 to 20 minis in a single computer system. Until the advent of low-cost microprocessors, multi-processor equivalents of mainframe and minicomputers using LSI modules were not built.

By mid-1975 there were, however, at least three companies working on such systems: Grumman Aerospace, using Intel's 3000 series of bit slice bipolar microprocessors; the now-defunct IMS Associates (Imsai); and a French firm, Realizations Etudes Electroniques (REE).

Grumman and REE based their systems on Intel's n-channel MOS 8080A microprocessor. In the Grumman approach, the aim was to interconnect as many as 10,000 microprocessor modules together to solve large problems that take many hours on a 370/168 mainframe. Initially, this scheme involved building one module and replicating it 10 or 20 times to improve performance two to three orders of magnitude (100 to 1,000 times) over the level of 370/168. The key to the potential high performance was that in each system, the individual microprocessors operated more or less independently on separate parts of a problem—or even on different problems.

In the REE approach, called the Micral-M, eight 8080s were interconnected with common memory. Using eight single board microcomputers based on the 8080A, the REE approach was supposed to be capable of handling 512,000 words of memory and performing three million instructions per second. Each processor

had its own local memory, but also shared part of a common memory, which held the program. Similarly, each processor was able to draw on the resources managed by another. The key to the system was a custom-designed schottky TTL LSI hardwired logic circuit that set the priority of access to the common memory, and resolved any simultaneous accesses of equal priority.

One of the most well-known attempts was made by the now defunct hobby computer maker, Imsai. Called the Hypercube, it was designed so that users could write distributed programs in low-level assembly language for each 8080A in the system. The basic operating unit is a subsystem consisting of two 8080A microprocessors, plus memory and interface circuits, mounted on a pair of pc boards. Each subsystem was located at a node of the Hypercube and connected to eight other subsystems in adjacent nodes. One of the 8080As executed the user program, while the other handled the overhead and communications tasks and the operating system software.

With the 8080A's direct memory access capability, one subsystem accessed another's memory, while the subsystem at the other node performed its own calculations. In use, some of the nodes were to be assigned the responsibility for processing input or output data, or interfacing with a printer, keyboard or disk storage unit and they would make data available to other nodes.

The Hypercube approach was configured so that users could program each node to perform its function, and the operating system built into each node would take over internodal communications. This was supposed to make programming not much more difficult than successive programming of single 8080As.

Each node in a Hypercube configuration was designed to have an instruction rate of 1 million instructions per second, a DMA capacity of 2M bytes per second and 16K bytes of user programmable memory, expandable to 64K bytes.

### Hypercube exceeds many mainframes

This approach had the potential of performance that more than matched that of most mainframe CPUs. The simplest configuration—Hypercube II, consisting of 16 nodes—was designed to have an aggregate execution rate of 16 million instructions per second, a capacity of 256K bytes to 1.2M bytes of user program memory and the capacity to perform three million memory-to-memory additions per second. Comparable performance figures for the 81-node Hypercube III was projected to be 81 million instructions per second, 1 to 4M bytes of user program memory and 15 million additions per second; and 256 million instructions per second, 4 to 16M bytes of user program memory and 48 million additions per second for the 256-node Hypercube III.

Despite the advantages of multiprocessor systems as an alternative to mainframe uniprocessors, there have been few commercially viable systems constructed to date. Aside from the lack of sufficient computing power and local memory as well as cost, a number of problems remained to be resolved before they could become a practical alternative to more conventional organizations.

The limited address space of most present generation microprocessors such as the Z80, 8080, 8085 and 6800 requires the use of memory mapping to manage large physical memories. Mapping reduces a pro-

cessor's effective power by 5-20%, depending on the CPU and application.

Increased operating system overhead caused by interprocessor communications can reduce the effective power of the processor also. This overhead is a function of the number of messages transmitted between processors per unit of time, as well as the physical transfer method involved.

Multiprocessor systems are susceptible to defects when symptoms appear in one processor, even though the problem is really in another one altogether. The potential for this kind of problem increases with the tightness of the interprocessor coupling and the absence of interprocessor error checks. To correct interprocessor defects of this sort, a certain amount of message overhead may be necessary to isolate problems of the offending processor.

### Several questions remain

Response time of a multiprocessor system can exceed requirements if the interprocessor communications facility doesn't provide adequate bandwidth for the message flow.

There are several important questions to consider. How should tasks now executed on uniprocessors be decomposed so that they can be run on a set of smaller processors? Can compilers or specialized run time systems be developed to do this decomposition automatically or must the programmer do the decomposition explicitly?

What are the most effective types of processor/memory and processor/processor interconnection structures, and what are the related communication protocols?

What mechanisms are appropriate for performing the virtual-to-physical address translation? These mechanisms should allow processors to share code and data, while ensuring adequate levels of protection and performance.

What software structures are suitable for large systems containing hundreds of interconnected microprocessors? Among the important problems in this area are resource management, software distribution, protection and reliability.

Even after tasks have been decomposed to run on multiple microprocessors, how should interprocessor interface and contention for memory and I/O resources be minimized?

With multiple microprocessors contending for resources, the potential exists for a situation wherein each of a group of processors is waiting for resources assigned to other processors in the group, and none of the processors is able to proceed until its demands are satisfied. This situation effectively disables all the processors involved and special care must be taken in the design to avoid it.

What hardware and software structures will allow a multi-microprocessor system to realize its potential for surviving failure of components in the system?

How should input and output devices in general, and secondary storage devices in particular, be integrated into a multi-microprocessor system?

Since the early 70s, an enormous amount of research has gone into answering these questions. Next month's article will discuss what researchers consider the most appropriate multi-microprocessor configuration. □

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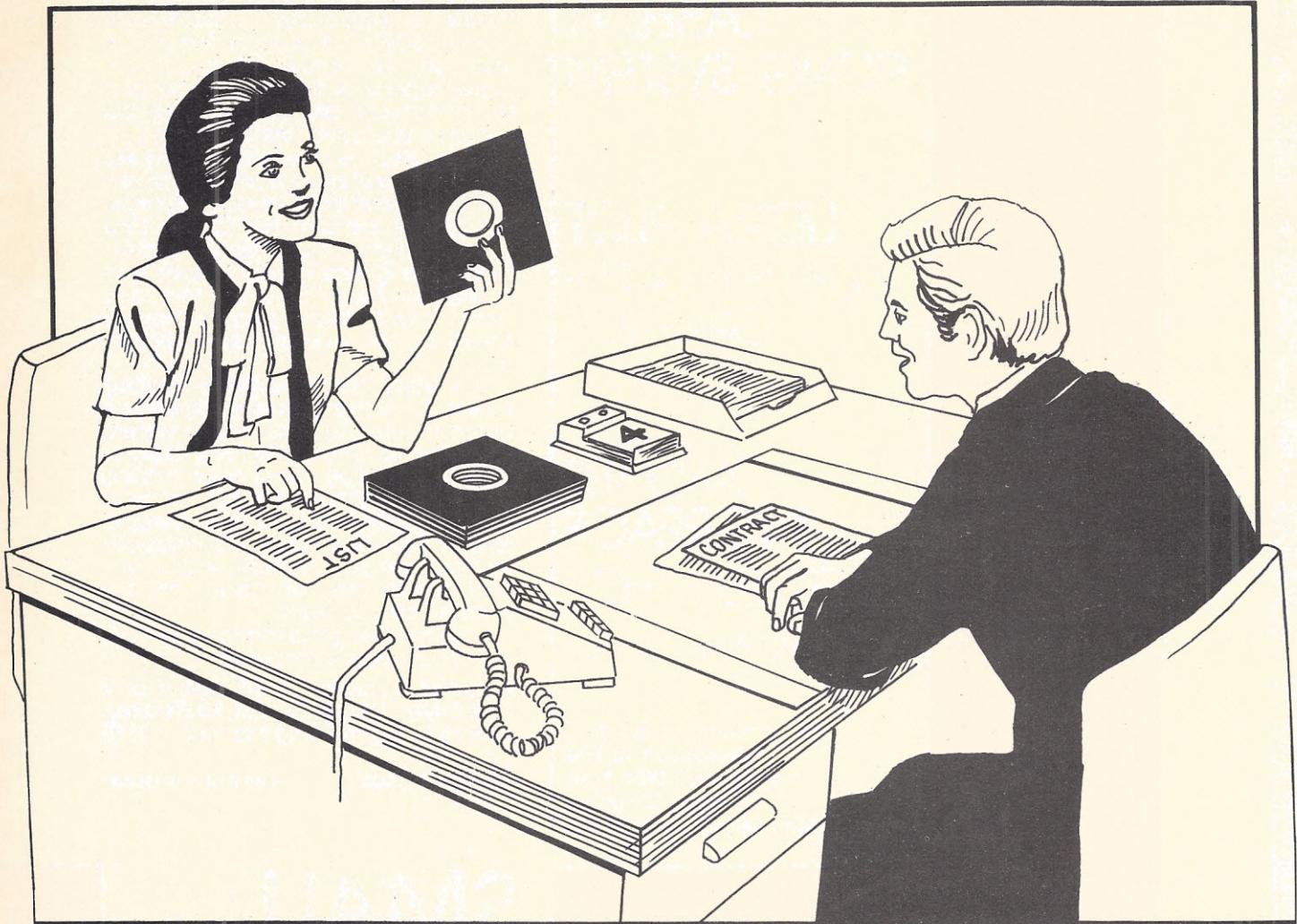


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# NEGOTIATING FOR YOUR SOFTWARE



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by Reginald D. Gates

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There are three ways you can obtain software for your business. You can buy an "off-the-shelf" package, you can write the programs yourself, or you can pay someone else to develop a customized system. This third alternative is expensive, but it can produce a quality system well suited to your needs. It can also produce a nightmare—a system that costs too much, that wasn't delivered on time, and that won't do what you want.

One way to avoid a nightmare is to negotiate an appropriate contract with the people who will develop the software for you. Usually you can depend on your lawyer in contract negotiations, but he may not be

knowledgeable in the area of computer software. Following is a list of points to be reviewed with both your attorney and the software people. Although certain approaches are suggested, other issues may come up and other solutions may be more appropriate than those given.

A contract for custom system development should be regarded as a "meeting of minds" about the work to be done. Avoid making the negotiations into a battle. There are some areas that can be compromised (and some that cannot), but the approach should be to develop mutually agreeable solutions to the problems.

*Statement of Work* is the most important part of the contract. Quite simply, it describes what is to be done. It should cover at least these three areas: (1) the function of the system to be developed; (2) the capacities

or limitations of that system, and (3) the hardware and software to be used.

When this section is developed, be as specific as possible—avoid sales phrases like “rapid response to management’s needs” and “readily adaptable to changing business situations.” If reports are to be produced, describe them and give samples. If existing documents will be used to provide input to the system, provide samples of these documents. Specify exactly what computer system and hardware will be used and what limitations will be inherent in the system. Give an overview of the flow of data through the system. Figure 1 shows a brief example of a Statement of Work for an accounts payable system.

### Developing contract takes special abilities

Obviously, developing this portion of the contract takes a lot of work and some special abilities (accurately estimating disk file sizes, for example). One of the best approaches is to have the software people develop the statement based on interviews with you and your staff. You should expect to pay their regular time and material rate (which will be high), but only for the relatively short time necessary to produce a Statement of Work. This method has several advantages. You get to interact with the software people and find out if they are able to comprehend your business problems—if they can’t, don’t use their services. The statement can also be sent out for bid to several different vendors to find out how complete it is and ascertain the cost of the system. An additional benefit is the sample of the type of documentation that the software people can produce. This is quite important, since a system is only as good as its documentation.

Now that you’ve determined the task requirements, the next question is the price of the system. In some instances, the software vendor will give you a fixed price bid and you will need to know exactly what this covers. For example, if the proposed system requires a new printer, is its cost included in the bid, or did they bid software only? If both the hardware and software are rolled into the bid, you might consider asking them to break each item down separately so that you can see if it would be better for you to purchase the hardware yourself. If the vendor is bidding software only, exactly what equipment must you purchase?

Most vendors will want to bid the project on a time-and-material basis. In this case, you will need to know how the time is calculated—for example, is travel time included? If the work is to be done at the vendor’s site, you should discuss how the labor hours will be monitored and controlled by the vendor. If overtime is required to meet your schedule, will you pay the regular rate or an overtime rate? The contract should also contain a clause that will protect you from rate increases while the contract is in effect.

Suppose the system is to be developed on the vendor’s computer. Will you be charged for the use of his machine? If so, at what rate, and how will this expense be controlled?

Payment schedule and system acceptance present further complications. Basically, the vendor wants to be paid as the work is done, since that is the way he incurs his expenses. On the other hand, you don’t want to pay until the system is finished, so you can be sure that it performs to your satisfaction. A procedure to

determine that the system works must be established and documented in the contract so you will feel comfortable in paying.

Usually this procedure will call for some sort of system acceptance test. This means that the vendor will turn over the system to you, and that you must test

Magic Software, Inc. will design, program, test, and implement an accounts payable system for the Rapid Machine Works. The system will be written in Applesoft Basic and run under DOS 3.3 on an Apple II system with 48K of core. The system must have two 5 1/4 in. disk drives (minimum capacity 130,000 bytes each) and a printer capable of printing 110 columns in width, equipped with a tractor feed.

The following reports will be produced (samples are included as an attachment to this document).

Vendor List	Invoice Register
Open Invoices	Paid Invoices
Checks	Distribution Journal

The Vendor list can be produced in either vendor number or name sequence. The check report must use the existing check form used by Rapid Machine Works, as shown in the sample.

The system will be able to accommodate a maximum of 300 vendors at any one time. It will be able to produce a maximum of 600 checks a month, and the maximum amount of any one check will be \$99,999,999.99. The maximum balance for any vendor will also be \$99,999,999.99. Up to 300 invoices a month can be processed through the system.

A diagram of the data-flow through the system is attached to this document.

**Figure 1. The Statement of Work**

Upon completion of its testing, Magic Software will install the accounts payable system on the Apple II computer located in the Rapid Machine Works office and notify Rapid in writing that the system is ready for Acceptance Test. Rapid will have ten working days in which to test the system to its satisfaction. If an error occurs, Magic Software will correct the error at no cost to Rapid and the ten-day acceptance period will start over. If the acceptance test is completed prior to the ten-day period, Rapid will notify Magic Software in writing. If the ten-day period lapses without any notification to the contrary, the system will be considered to have been accepted.

Rapid Machine Works agrees to pay Magic Software for the development of the system on the following schedule: 50% of the total amount due at the beginning of acceptance test and the remaining amount due within 15 days after the successful completion of the Acceptance Test. Charges related to training will be paid within 15 days following the completion of training.

**Figure 2. The System Acceptance Test**

it in order to determine if it works or not. (For an accounts payable system, you might run your last month’s payables through the new system.) This will take time and effort on your part, but a good acceptance test will do a lot for building your confidence in the vendor’s work. An example of an acceptance test provision is shown in figure 2.

Once the vendor begins work and gets into the project, changes may have to be made in the Statement

of Work. There might have been some misunderstandings, or additional research may turn up holes in the design, or you might change your mind about what you wanted. In any case, there has to be a procedure that enables you to communicate these changes to the vendor and enables him to respond with any modifications in the cost or schedule for the system.

If there is a definite date when you need the system to be operational, this date should be clearly stated in the contract. What happens if the date is missed by the vendor—will there be a penalty assessed against him? This point needs to be specified.

A couple of interesting questions need to be answered in terms of ownership. First, who owns the finished software? May the vendor resell the system developed (and paid for) by you on the open market? If so, perhaps he should compensate you, either by royalties, or by reducing charges, since he will be gaining revenue from the system.

Here is another consideration. Suppose the contract states that the vendor owns the software and you open a new branch office for your business. Can you copy your existing software and install it in the new branch? Can you sell the software as an asset if you sell your business?

#### **Vendor may modify package**

The vendor may choose to purchase an existing package and modify it for your needs. You need to be certain that all the software supplied to you is legally his and that he has the right to sell it to you. Figure 3 gives an example of software ownership clauses that address these points.

If the system deals with sensitive areas of your business such as payroll or accounts payable, the contract should contain a clause preventing the vendor from disclosing this data to your competitors (and perhaps your employees). If you provide him with copies of your files (i.e., last month's payroll), the contract should be clear that this data is yours and must be returned when the contract is terminated.

If the work is to be done on your computer, how will the vendor have access to it? Will he be allowed to remove the machine, or will you let him into your office

after-hours? In the first case, what happens if the machine is stolen or damaged while in his care? In the second, what would happen if one of the vendor's employees injured himself while working in your office?

Since you will have to run the system after it has been accepted, the system must be documented and your staff must be trained. The extent and type of both

1. Magic software shall be the owners of the accounts payable system developed for the Rapid Machine Works and shall have the right to market it if Magic so chooses, provided that a royalty of 15% of the purchase price will be paid to Rapid for every accounts payable system sold. In the event that hardware is sold along with the software, the royalty will be computed on the price of the accounts payable software alone. If the system is included with other software, such as an integrated accounts payable and accounts receivable package, the royalty will be calculated based upon the usual price of the accounts payable package alone. In the event that Magic Software discounts the accounts payable package to a customer, the royalty will still be 15% of the full price.

Magic Software shall not sell this software or any software of which this system is a part to any other software vendor without prior written permission from Rapid Machine Works.

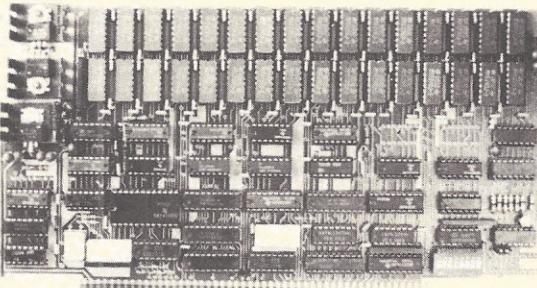
2. Magic Software holds that all of the software supplied with the system (with the exception of the Applesoft Basic) is its own and that Magic has the legal right to sell or provide this software to Rapid Machine Works. Magic Software will protect Rapid Machine Works against any claim that the software Magic has provided violates any licensing or copyright rights.

**Figure 3. Ownership of the Software**

documentation and training should be specified in the contract. You will need to agree on how the training will be done and how the vendor will be paid for his involvement in the training.

Reviewing all of these points and including them in the contract will benefit both you and the software vendor. You will be more certain that both parties are satisfied. □

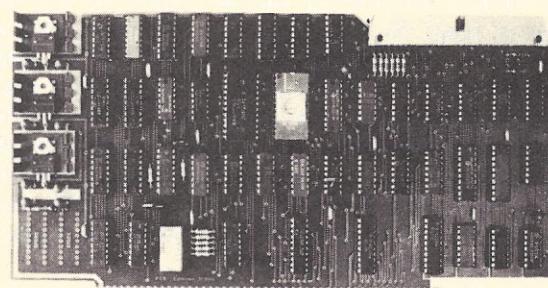
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## WHERE TO BUY YOUR SOFTWARE

by Louis E. Frenzel, Jr.

It used to be that the biggest problem with owning a microcomputer was that there was little or no software available. In the mid-70s when micros first appeared, about the *only* thing you could buy was hardware. If you had a Basic interpreter, a monitor in ROM, or an editor/assembler, you had just about all the software that was available. If you wanted specific applications programs, you had to write them yourself.

Now all this has changed. There are all sorts of software available for dozens of different kinds of microcomputers. Not only are there many different kinds of systems software packages and languages, but also there are thousands of applications programs available to make the microcomputer useful. Software for business, accounting, finance, science, engineering, and education is readily available for the most popular machines. In fact, there is so much software available that the main problem is deciding the best place to buy among several good choices. What a

terrific problem to have! Following is a rundown of the alternatives available to the software shopper.

### The computer stores

Since the greatest percentage of software for microcomputers is sold through computer stores, these should be your first target. If you are going to find the best piece of software for your application, you are going to have to shop around. Don't go to just one or two stores near your home; visit as many in your area as possible. Go to ask questions and learn. Prepare a concise list of your exact application needs, then ask the salesman if he knows of any software that will fill the bill. Ask about alternative sources and try to find out which piece of software is the most recommended. Look through all of the software available in the stores. Get sales brochures if they are available. If the documentation and manuals are available, take the time to review them. Ask what other customers are using to perform similar applications.

If you survey enough computer stores, you will eventually begin to see some patterns emerge. Assuming software is available for your application, you will begin to hear a number of stores repeating the names of the applicable software packages. You may also get a hint

as to what the most popular or highly regarded package is. It is possible that you may discover that there isn't any specific software available for your application. If this is the case, you will need to have your software custom-designed. (See article on page 118.)

Your survey of computer stores should also include the new software shops that are appearing around the country. The latest trend is retail stores that specialize only in microcomputer software. Typical of such outlets is the Software Store chain in the Los Angeles, CA, area. Even Computerland, the largest retail computer store chain, is trying out this idea by opening a number of satellite software stores.

On the East Coast, a number of software-only retail centers have opened. The largest is a new chain called Programs Unlimited Computer Centers with stores on Long Island and in White Plains, NY. Other outlets are planned for New York and New Jersey locations. The Microcon Software Centers are another East Coast chain of software-only stores. Specializing primarily in business applications software, Microcon stocks thousands of different software packages. The Program Store chain in the Washington, D.C./Maryland/Northern Virginia area is another example of a successful software outlet. Check your area for software specialty stores, as they are sure to be one of your best program sources.

### The manufacturers

While most of the microcomputer manufacturers specialize in hardware, many also supply a considerable amount of software. Apple, Radio Shack, Heath/Zenith, Commodore, IBM and others sell not only systems software and languages, but also many applications programs as well. A good starting point for your software search is to go directly to the manufacturer of your computer.

Try to get a copy of the latest software catalog from the manufacturer. These catalogs date quickly, so try to get the most recent edition and get on the mailing list for updates.

Also check into the existence of users' groups. Many manufacturers sponsor organizations of customers whose purpose is to exchange information on their systems and applications. Many users groups solicit and sell software and publish newsletters and magazines that regularly give information about the availability of software packages and other accessories for a given machine.

A number of microcomputer manufacturers also have customer hotlines. I recently witnessed the operation of such a line at Commodore. Customers can call and get first hand information on the software packages available for their Commodore systems. It's a feature other manufacturers should have. Most manufacturers do have some kind of an 800 number or information telephone line, so take advantage of it. Ask your local store for the number if you don't have it.

### The magazines

One of the best sources of information on software are the various microcomputer publications. There are literally dozens of these and all of them cover software regularly.

Software coverage in the publications comes in three different forms: ads, articles and reviews. The

ads are the best source of information about basic software packages. Pick up two or three popular computer magazines the next time you are at the computer store, or order subscriptions. There are literally hundreds of software ads in most magazines. Note the ones of interest to you and write for additional information.

Most magazines also regularly feature software articles. A high percentage of these cover specific software packages. Some of the best articles are those that compare and contrast similar software packages. In recent magazines, I've seen comparison articles on word processing packages and data base management systems, for example. Many of the microcomputer publications also regularly publish software reviews, wherein specific packages are evaluated and critiqued.

### Mail order firms

There are several large mail order distributors with whom you should check before buying software. One of the largest is Lifeboat Assoc., New York, NY. This company publishes an enormous software catalog and features software for CP/M-based machines. You will spot Lifeboat ads in most of the microcomputer publications. There are numerous other large mail order software distributors. All of them will send you a catalog. Look for them as you scan the magazines.

You will also discover that one of the main benefits of buying by mail order is discount prices. Since mail order firms do not have the overhead of a retail store, they can often sell the software below the suggested retail list price. The big disadvantage, however, is service, or lack thereof. While the larger mail order distributors do offer

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service by telephone, others do not. If you suspect that you may need help with your software, try to purchase it from a local store. They will be able to provide the hand-holding assistance you may need.

### The directories

There is so much software now available for microcomputers that a number of publishers have begun to catalog it. Today there are a number of good microcomputer software directories available. These directories can be an excellent resource. As you might imagine, they are virtually out of date the minute they are published. However, the better directories are revised frequently. Some are quite expensive, so it might be worthwhile to try to borrow one rather than buy it. But others are reasonably priced. They are a modest investment to help you find a good piece of software.

*The International Microcomputer Software Directory* offers over 5,000 programs cross-referenced by application, machine, operating system and vendor. Quarterly updates are provided. Price: \$29.95. Order from: Imprint, 420 South Howes, Fort Collins, CO 80521.

*Directory of Microcomputer Software* is a two-volume loose leaf directory, covering over 2,000 programs by over 1,000 companies. They are indexed alphabetically, geographically, by application and by product name, including acronyms. Monthly updates, a monthly newsletter and a telephone inquiry service are included. Price: \$340. Order from: Datapro/McGraw-Hill, 1805 Underwood Blvd., Delran, NJ 08075.

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*The Apple Software Directory* includes thousands of programs categorized by business, games and education subjects. Price: \$19.95. Order from: WIDL Video, 5245 W. Diversey Avenue, Chicago, IL 60639.

*Commodore Software Encyclopedia* catalogs all the software for the popular Commodore Pet and CBM line of computers in all categories. Price: \$4.95. It is available at Commodore dealers, or write: Commodore Business Machines, Computer Systems Div., 300 Valley Forge Sq., 681 Moore Rd., King of Prussia, PA 19046.

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# Sorcim's SuperCalc

## A VisiCalc-Like Program for CP/M

by Alan R. Miller

Pascal/M is a programming language developed over the past several years by Sorcim, San Jose, CA. (See IA Jan 82.) Now Sorcim is offering an applications program called SuperCalc that is similar to VisiCalc (IA May 80 and Aug 81). Both products can be used for complicated tasks, such as analyzing business transactions or predicting trends. They can also be used for simpler jobs such as balancing a checkbook. VisiCalc, which has been available for several years, runs on computers such as the Apple, TRS-80, Atari, Pet, and the IBM Personal Computer. However, unlike SuperCalc, there is no CP/M version.

SuperCalc uses direct cursor addressing. As a consequence, it may be necessary to configure your copy by initially running a separate program called Install. Of course, this only has to be done once. There is a list of over 50 different commercial video terminals to choose from. SuperCalc can also be tailored for the printer at this time (e.g., an 80-character line or 132-character line).

The rather detailed user's manual contains over 100 pages. It is unusually well written and set in high-quality type. There is a table of contents, but no index. The manual is assembled into a ring binder so that the pages lie flat when in use. The manual begins with an introduction and overview of SuperCalc. It then continues with a series of hands-on lessons using sample files provided on the disk. A summary of all commands and a glossary of computer terms are also provided. A separate reference card can be used to readily find the details of particular features.

When the initialized SuperCalc is started up, the user is offered a summary of the commands. However, this step can be bypassed if desired. The next step is to load a work file that was saved from a previous session, or create a work area directly on the screen. Help can be obtained at any point by typing a question mark. The SuperCalc direct commands are given by a slash followed by a single letter. When the user types the slash and the initial letter, SuperCalc immediately finishes spelling the rest of the word. For example, a file is loaded by typing the command /L and SuperCalc fills out the word to /Load. If a /D is entered, SuperCalc displays /Delete.

The information can be visualized as a table or matrix of values. Information in the table is located in cells that are referenced by a column letter and a row number. For example, the cell at the upper left corner is

designated as A1 and the cell that occupies the second column and the third row is referred to as cell B3. Notice that this terminology is reversed from the usual mathematical reference in which the row index is given before the column index.

Cells may contain a numeric value, a string of alphabetic and numeric (alphanumeric) characters, or a formula. There is a cursor designating the current cell, the one that can be altered. The cursor can be moved by the regular keyboard cursor arrows, in addition to the Control-D, X, S, E combination adapted by WordStar. The coordinates of the current cell are given at the bottom of the screen.

After a value has been entered into the current cell, the cursor moves to the next cell. The direction of motion is the same as for the previous entry and is indicated on the bottom of the screen. Thus, if a column of figures is to be entered in cells B2 through B5, the cursor could be placed in cell B1, then moved downward to B2. Each succeeding entry moves the cursor down one cell. On the other hand, the active cell can be directly changed to any location by entering an equals sign and the coordinate of the desired cell. For example, typing = K9 moves the cursor to cell K9.

Some cells in a column might contain numbers, while others contain characters. Suppose that cells B2 through B5 contain a list of numbers to be added. The cell directly below the last number (B6) can contain a dashed line. The cell directly below that (B7) will then contain the formula:

SUM(B2:B5)

indicating that the sum of columns B2 through B5 belongs here. The user actually types this command. However, the screen will display the resulting sum. For example, the screen might look like this:

12.35	(cell B2)
9.95	(cell B3)
15.67	(cell B4)
8.56	(cell B5)
-----	(cell B6)
46.53	(cell B7)

Suppose further that a 4% sales tax is to be added to the above total. Then cell B8 could contain the formula 0.04\*B7. Cell B9 could contain another dashed

line and cell B10 could calculate the grand total with the formula  $1.04 * B7$  or  $B7 + B8$ . If any of the values in cells B2 through B5 are changed, the results displayed in cells B7, B8, and B10 will automatically change to reflect the current values. The status line at the bottom of the screen always displays the originally entered data for the current cell, even though the calculated result is usually displayed in the current cell. However, there is a command to change the video screen so that the originally entered data is displayed rather than the results.

Altering the contents of a cell is very easy. There is a command to copy the contents of a current cell into the command line. The cursor-movement keys can then be used to overwrite, delete, or insert characters. Individual cells or groups of cells can be moved or replicated into other regions of the table. If a row or column of cells is eliminated, all the remaining cells move up or over to fill in the void. Of course, the coordinates of these moved cells are changed, and any formulas that make reference to these moved cells are also automatically changed.

The top row (row 1) and the left column (column A) will usually contain alphanumeric information describing the remaining cells. The width of each row and column can be individually selected as appropriate. Consequently, Column A can be set at 20 spaces to fully describe the corresponding row. Only a limited amount of information can be displayed on the usual video terminal at any one time. Yet SuperCalc allows up to 63 columns (A-Z, AA-AZ, BA-BK) and up to 254 rows (1-254). Consequently, the information in the table can be scrolled vertically and horizontally on the screen so that all of the information can be viewed.

There are several interesting features that make it easy to alter values throughout the table. The first row or the first column can be locked into place, so that heading information is always displayed on the video screen. For example, if the top row is locked and the table is scrolled vertically upward to row 30, the top row is always visible at the top of the screen.

#### Screen can be divided

Another nice feature is split-screen mode; this option allows two different portions of the screen to be seen at one time. The left half of the screen can be separated from the right section. By this means, the upper-left section of the table can be displayed on the left side of the screen and the lower-right section can be shown on the right half of the screen. Each can be independently scrolled. A command of a semicolon is given to move the cursor from one side of the screen to the other.

It is also possible to synchronize the two halves of the split screen. Suppose that the left side shows the upper-left section of the table (say January, February and March sales) and the right half shows the upper-right section of the table (say October, November and December sales). (The middle section of the table would not be shown in this case.) The two halves of the screen can now be locked together, and both can be vertically scrolled. By this means, the first three months' sales can be compared to the last three.

Yet another possibility is to display the identical cells on both the left half and the right half of the screen, but with different formats. The cells on the left side could display the numeric values of the data, while the cells on the right could display the corresponding formulas.

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CIRCLE INQUIRY NO. 51

The user has complete control over the displayed form of the data. It is possible to select integer, general, exponential (scientific), or dollar format. SuperCalc uses 14 digits of precision. Alphanumeric data can be right-justified or left-justified. These formats can be selected globally (over the entire display), for each individual cell, or for a particular column or row. Data can also be displayed in graphic mode. In this case, the information is displayed as a histogram of asterisks.

At any point, the current state of the table can be saved as a disk file. Thus, at a later date, it can be reloaded and changed. Of course, the final version can be printed on the list device.

The arithmetic functions include SUM, AVERAGE, MIN, MAX, INT, ABS, SIN, COS, TAN, ASIN, ATAN, EXP, SQRT, LN, LOG10 and PI. There are also conditional expressions. These are used to display one result if another cell or group of cells has a certain value, or to display a different result otherwise. Conditional expressions are formed with IF, OR, AND, and NOT. The formulas can include the operations of addition, subtraction, multiplication, division and raising to a power. There are also the usual logical operations such as less than, greater than, equals, etc. Thus a cell could be set up to display one value for a positive balance and a different value for a negative balance.

SuperCalc is a super program. Anyone can readily learn how to use it. Programming ability is not necessary, but possession of a computer with CP/M is. The program is written in the grand style of Microsoft Basic, Spell-guard, and MicroPro's WordStar. □

# NEW PRODUCTS

**Programmable color computer,** Commodore Ultimax, is easily connected to any color TV set. It features a flat membrane keyboard, programming in Basic, and uses both cartridges and cassettes for games, programming and music synthesis. It is compatible with joysticks, paddles and light pens. It uses the VIC Datasette tape recorder for program storage, and serves as a sound generator for polyphonic tones and for music synthesis. Price: \$150. Commodore Business Machines, Computer Systems

Div., 681 Moore Road, King of Prussia, PA 19406, (215) 337-7100.

CIRCLE INQUIRY NO. 221

**Technical computer systems,** 3100 and 3105 in the Vector 2 series, are aimed directly at industrial/scientific applications for automating laboratory experiments, procedures and data processing. The 3100 includes a Vector 3 Z80-based processor and terminal, two 5 1/4-in. double-sided floppy disk drives for a total of 1.2M bytes of storage and an 18-board card cage for a

variety of S-100 bus interface cards. The 3105 has the same terminal and card cage, but with a 5-in. Winchester disk with 5M bytes of storage backed by a single 630K-byte floppy disk. Interface boards available from the manufacturer include a fast-scan video digitizer; a high-resolution graphic module; precision 12-bit digital-to-analog converters; high-speed multichannel analog-to-digital converters; clock/calendar; and a PROM/RAM memory board for additional storage and PROM programming

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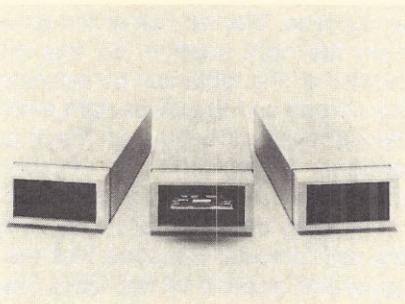
3209 Fondren Road  
Houston, Texas 77063



capability. The 3100 system is priced at \$5,795. The 3105 system's basic price is \$8495. Vector Graphic, 500 N. Vento Park Rd., Thousand Oaks, CA 91320, (805) 499-5831.

CIRCLE INQUIRY NO. 222

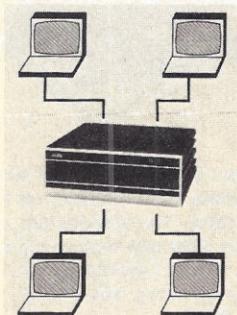
**Business computers,** Systems 2832/2834 and 2842/2844, combine a 20M-byte or 40M-byte 8-in. Winchester with a 20M-byte 1/4-in. cartridge drive for backup. The 2832 utilizes the Super CP/M operating system; the 2842 features an enhanced MP/M or OASIS operating system for multi-user, multi-tasking operations. Both versions have been designed to provide a combination of streaming or file-by-file backup to increase the system's versatility. Only 12 minutes are required to back up



20M bytes. They are compact, self-contained systems having a tape data transfer rate of 30K bytes per second and a tape speed of 30ips. Each tape cartridge features four recording tracks with a recording density of 8,000 bits-per-inch. When unformatted, storage capacity for the tape cartridge is 20M bytes. The System 2832 has a price of \$11,400; the 2834, \$13,160. Systems Group, 1601 Orangewood Ave., Orange, CA 92668, (714) 633-4460.

CIRCLE INQUIRY NO. 220

**Multi-user systems**, 8000-12 and 8000-14, feature expanded integral fixed disk memory capacities of 20 and 40M bytes. Using Winchester technology, the 8000-12 system offers 20M bytes, or twice the storage capacity of the original system. Likewise, the 8000-14 provides 40M bytes—four times the capacity. The new 8-bit, Z-80 systems have four separate memory partitions, permitting up to four users to perform different applications simultaneously. They are compatible with



an extensive software library, including the CP/M, MPM, and OASIS operating systems; with hundreds of business application programs and with a wide array of special function software, including data base management and graphics. Languages available include Basic, Pascal, C, Fortran, Cobol, PL/I and APL. Price: \$9,990 for the 8000-12 and \$11,990 for the 8000-14. Altos Computer Systems, 2360 Bering Dr., San Jose, CA 95131, (408) 946-6700.

CIRCLE INQUIRY NO. 223

**Advanced home computer**, Commodore-64, is programmable with a CP/M option, and has 64K of memory. The system has a full 66-key typewriter keyboard with upper and lower text capability, function keys, graphic characters, "smart" peripheral devices, a cartridge game slot and game controllers. Its audio capabilities will include sound generation, polyphonic tones, music synthesis and hi-fi output. Price: \$595. Commodore Business Machines, 681 Moore Road, King of Prussia, PA 19406, (215) 337-7100.

CIRCLE INQUIRY NO. 224

**Intelligent terminal**, MX-700, has eight full pages of memory standard (192 lines of 80 characters) and 16 pages of memory as an option. It can be configured either as a full screen 160 columns by 66 lines or with split screen displaying two 80-column by 66-line pages side by side. Smooth scroll adds 30 additional lines to both configurations. 96 ASCII upper and lower case characters with descenders plus 32 line drawing graphic symbols are standard. Using a P4 Phosphor 17-in. high resolution tube, any combination of characters can be displayed with any combination of attributes—blink, half intensity, reverse video, double high, double wide and double

high/double wide. A single board contains an 8085 microprocessor with direct memory access and 32K bytes of RAM. RS-232C interface is standard. An



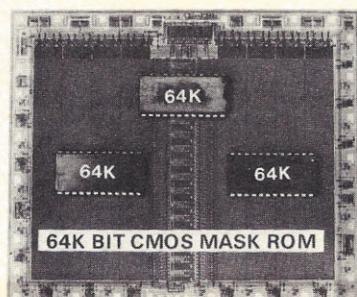
eight-connector STD BUS is provided for convenient memory and I/O expansion. Ten transmission rates, from 75 to 19.2 bps., are keyboard-programmable. The terminals are DEC VT100-compatible. Prices start at \$2,195. Omega Data Peripherals, 4357 Park Dr., Norcross, GA 30093, (404) 923-6342.

CIRCLE INQUIRY NO. 226

**Z80 monitor**, Bigbug, is designed for TRS-80 level II, to allow full control of assembly language programming. Features include: ROM based monitor (does not need back up); a target program can be resident anywhere in memory; user can set up to 8 break points; tape storage with file name; direct access of I/O; hardcopy for the debugging history; mnemonic key-in of user registers; hexadecimal calculator; can be treated as a subroutine from user program; RS-232 driver software can be built-in; user can put his own EPROM (game, etc.) into this monitor hardware to save loading time. Price: \$75.00. Future Project Corp., P.O. Box 11, Hawleyville, CT 06440, (203) 775-3062.

CIRCLE INQUIRY NO. 227

**64K CMOS mask programmable ROM** series is introduced with the MP2364C, 64K, CMOS ROM. The unit features low power dissipation and a fast access time.



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CIRCLE INQUIRY NO. 6

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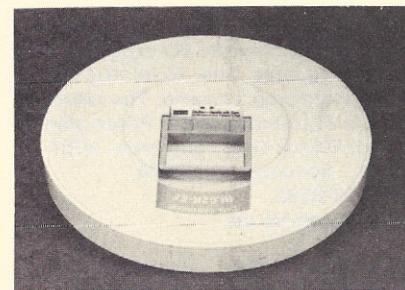
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as fast as competing devices on the market. The unit has a 8192 by 8 memory configuration, interfaces with a number of microprocessors, and is pin-compatible with the Mostek MK36000. The device is packaged in plastic. However, special CERDIP and ceramic packaging can be ordered. Minimum order quantity is 500 pieces. In addition to a nominal programming charge, the price for 1,000 devices (24-pin plastic) is \$17.90 each. Memory Product Marketing, Micro Power Systems, 3100 Alfred St., Santa Clara, CA 95050, (408) 727-5350 ext. 234

CIRCLE INQUIRY NO. 228

**Impact detector**, Shockwatch, changes color from white to red when it is affected by an impact of a pre-selected amount of force. The device is a small, tough glass capsule that uses a combination of liquid surface tension and capillary action to detect and flag mechanical shock. This may indicate possible damage to the unit



to which it is affixed. For one of its several uses by the computer industry, it is designed to be an integral part of any of six configurations of disk packs, covering virtually every unit offered by the major manufacturers. Media Recovery, 435 Round Table Dr., Dallas, TX 75247.

CIRCLE INQUIRY NO. 229

**Eight-inch Winchester drives**, Trak Star, are designed for the support of multi-station business and word processing systems. The family of drives features ANSI interface, a wide range of capacities and fast access times. The unit is available in three versions, with 33, 67 and 84 megabyte capacity. The D-8033 records on 476 tracks per inch, and the 8066 and 8084 on 952 TPI, with all three recording



at 8200 BPI. All models have an average positioning time of 45 µs, and a data transfer rate of 8.5 M-bits/sec. Overall dimensions are 4.65 in. (118 mm) high, 8.58 in. (218 mm) wide and 14.31 in. (364 mm) deep. Weight is 18 lbs. (8.16 kg). OEM quantity pricing starts at under

\$2,000. Pertec Computer Corp., Peripherals Div., 21111 Erwin St., Woodland Hills, Calif. 91367.

CIRCLE INQUIRY NO. 230

**14-in. diagonal screen** for video terminals displays 80 or 132 columns in large, crisp characters that measure a full 33% larger than on a 12-in. screen. Available in either green or white display, the 14-in. monitors represent a significant



improvement in readability over the older 12-in. versions and are easier on the eyes of the operator. The screens are also tiltable, non-glare and feature excellent resolution. Visual Technology Inc., 540 Main St., Tewksbury, MA 01876, (617) 851-5000.

CIRCLE INQUIRY NO. 225

**5 1/4-in. Winchester drive**, David Subsystem, uses the Seagate ST 506 and provides 5M bytes of formatted storage in a box that is only slightly larger than a normal 5 1/4-in. mini floppy drive (4.75-in. by 5.9 in. by 11.25 in.). It features 32-bit polynomial, 11-bit burst ECC, automatic flaw mapping and tracking, and write-precompensation. The subsystem is now available with host adaptors for the Apple and the S-100. Konan Corp., 1448 N. 27th Ave., Phoenix, AZ 85021, (800) 528-4563.

CIRCLE INQUIRY NO. 231

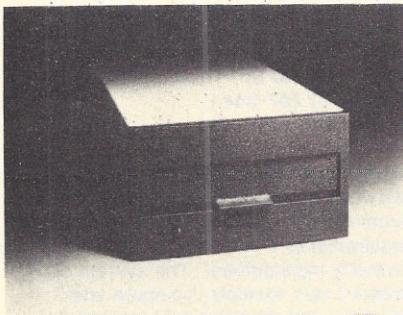
**Eight-in. Winchester disk drives**, SA1100 series, combine high-capacity and fast access time with easy system integration. Consisting of the SA1104 (20.3-Mbyte, two platters) and SA1106 (33.9-Mbyte, three platters), the series offers advanced functionality to the new system designer, as well as simple upgradability to the current user of Shugart's SA1000 series of eight-in. Winchester drives. The series uses Fastrak closed-loop servo positioning system to offer 35-mS average access time, the fastest in the low-cost eight-in. Winchester marketplace. The positioning system also provides recording densities of 500 tracks per in. Both of these specifications represent significant performance increases over the SA1000 Series, whose open-loop stepper system provides 172 TPI and 70-mS average access time. Other key specifications of the SA1100 series include 10-mS track-to-track access time, 70-mS maximum access time, 4.34-megabit/second transfer rate, and an MTBF goal of 10,000 power-on hours.

Scooros said the drive is targeted for stand-alone systems. The series features a brushless DC spindle motor and requires only +24VDC and +5VDC power supplies, eliminating the requirement for AC power

and the multiple configurations needed to address worldwide power requirements. Prices: SA1104 - \$1,550, SA1106 - \$1,875. Shugart Assoc., 475 Oakmead Parkway, Sunnyvale, CA 94086, (408) 733-0100.

CIRCLE INQUIRY NO. 232

**5½-in. floppy disk drive**, A-70, stores 286K bytes, a full 12% increase over the 256K bytes found in 8-in. floppies. Superior engineering results in improved performance. A longer, two-piece clutch means accurate diskette registration and less media distortion. A steel band



positioner provides faster head positioning and gives the disk drive about half the seek time of an 8-in. drive. Full software support provided with each drive includes compatibility with DOS 3.3, Pascal and CP/M. Price: \$699. The Schraff Group, 1000 Quail, Suite 140, Newport Beach, CA 92660, (714) 833-3660.

CIRCLE INQUIRY NO. 233

**Reconfiguration adapter**, the RS-232 DB25, consists of a printed circuit card with one male and one female DB25 connector mounted on it and incorporates a special matrix switch. This device enables users to instantly mate almost any serial I/O device to any computer by rerouting RS-232C signals. The device eliminates the task of fabricating special cables or resoldering existing cable wiring to achieve signal interfaces between a computer and peripheral I/O device, such as a modem, printer or terminal. A simple flat cable with DB25 connectors and the adapter will tie the proper signal lines together. Price: \$59.95. Mountain Computer, 300 El Pueblo Rd., Scotts Valley, CA 95066, (408) 436-6650.

CIRCLE INQUIRY NO. 234

**All-points-addressable graphics package** for Microline family of printers will enable users to address a dot anywhere on the printed page to create illustrations with even, flowing lines. The product gives users a resolution of 60 horizontal dots by 66 vertical dots per in. A software algorithm, which is included with the package in the form of a floppy diskette, allows users to easily translate data displayed by an Apple computer into parallel data that can be used by the Microline printers. An Apple computer displays data in a format of 280 by 192 dots per square in. The package is available for the Microline models 82A and 83A currently being sold. As a standard feature on the model 84, the package provides users with a resolution of 72 dots by 72 dots per square in. The package available for the 82A and 83A consists of

two programmable ROM modules and a floppy diskette, and is easily installed. Price: under \$100. Okidata Corp., 111 Gaither Dr., Mt. Laurel, NJ 08054, (609) 235-2600.

CIRCLE INQUIRY NO. 237

#### 24-hour life surveillance system

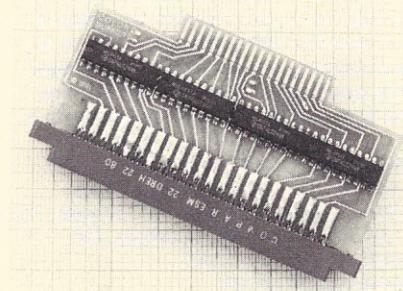
measures 5 in. by 7.7 in. by 1.75 in. It is for use in home and office. It is capable of issuing an ALERT signal (audio and visual) if there is development of any abnormality in human system. It is self-evaluative in nature and automatic. The system can be used to monitor babies in their early developments. It can also be used to detect potential ailments such as heart attacks, hypertension, etc. The system monitors temperature, pulse rate, respiration rate and blood index of MERIT continuously. This universal diagnostic system has been developed to serve as LIFE ALERT device in potential diseases and also to track development of abnormality in early stages of development. Medical Devices, 5540 Century Manor Ct., San Jose, CA 95111, (408) 972-1093.

CIRCLE INQUIRY NO. 238

**Executive Accounting System** is a complete accounting system for the Apple III computers. It is completely menu-driven and designed to be user-friendly, so no previous programming knowledge or experience is needed to operate it. The package records all financial transactions and generates standard financial reports. The system also prints checks, statements, and invoices, while calculating receivables aging and finance charges. Expandability includes provision for adding modules to handle inventory, letter writing, budgeting, graphic analysis and payroll. The system is being adapted to run on an expanded Apple II Plus and a Commodore Super Pet. Denver Software Co., 14100 Jewell Ave., Suite 15, Aurora, CO 80012, (303) 750-9980.

CIRCLE INQUIRY NO. 239

**Color Buffer** is a peripheral for the TRS-80 Color Computer. Gaining access to the system bus through the game slot cartridge, the device terminates in the standard 22/44 card edge connector, providing the hobbyist or experimenter with easy access to fully buffered address, data



and control lines. It also serves as a building block, allowing the user to plug in a variety of other peripherals now under development. The products include a RAM Cartridge, serial and parallel I/O board and an EPROM programmer. Price: \$59.95. TBH Canada, 67-3691 Albion Rd., Ottawa, Ontario, Canada K1T 1P2.

CIRCLE INQUIRY NO. 235

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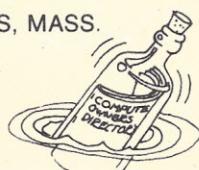
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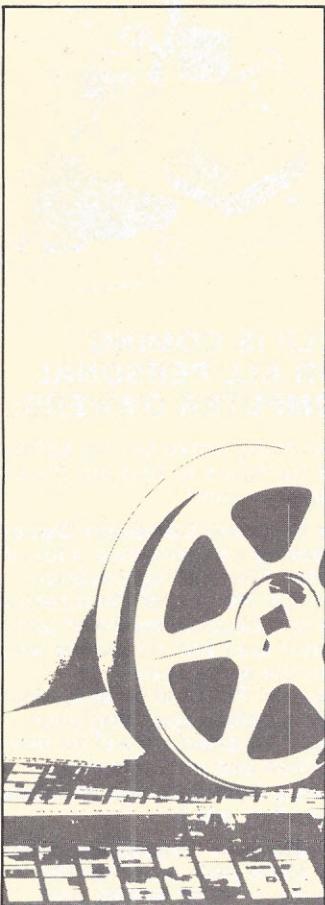
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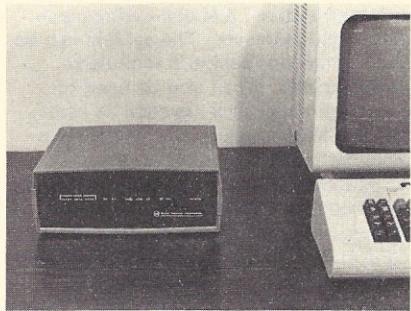


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**Voice/data modem**, ADA VIII, integrates voice and data output, with the resulting important capability to communicate—either by standard data link or by voicesynthesized messages—in easily comprehensible, human-like language. The modem enables any computer to perform four valuable functions: place or receive telephone calls; bi-directionally transfer data at 300 baud; speak in unlimited vocabulary of synthesized voice; receive



touch-tone information from distant telephones for control or data retrieval. This flexible interactive system connects to the host computer via an RS-232 interface, a standard interchange for computers, printers, modems and other peripheral devices. Through this communication link, all instructions to the ADAS can be issued, and status indications and modem data communicated. Butler National Corp., 8246 Nieman Rd., Lenexa, KS 66214, (913) 888-8585  
**CIRCLE INQUIRY NO. 236**

**Scheduling program**, Guardian, keeps an accurate calendar of single events, or an entire series, for years ahead. It has the storage capacity to organize up to 2,000 separate events for 200 people at once. All appointments and events, from tax deadlines to anniversaries and dental appointments to oil changes can be recorded simply and easily with single one-line entries, in plain English. It also internally adjusts its own calendar to allow for accurate planning, years in advance. It can be logged to flag events ahead of time. No computer language or knowledge is necessary to draw maximum use from the program. An on-line instruction manual that communicates in plain language will carry its operator through each step. A printed manual that is also included is complete and easy-to-understand. The program is recommended for use with any soft-disk drive system with 48K memory or more, and operates on any CP/M-based system or the TRS-80 (models I, II or III). The program is available on standard 5 1/4 or 8-in. disk, with storage sleeve. Price: \$199.95. Time Management Software, 123 E. Broadway, Box 727, Cushing, OK 74023, (918) 225-6340.  
**CIRCLE INQUIRY NO. 240**

**Mail-merge system**, Mail Mate, can operate with the Magic Window word-processing system or by itself as a stand-alone mailing/phone list system. To merge letters produced from the word processor, the user must produce a softcopy in the printer subsystem. This softcopy is not restricted in size. The system accesses the softcopy and merges it with the

addresses and names selected from the user's address list. The highlights of the system are: extremely quick sort on either the Last Name or the First Address Line field (usually the company name); string search on names of uncertain spelling; 10 selection fields (36 acceptable alphanumeric codes per field); flexible specification of selection codes for printing and logical ANDing between selection fields. It can operate on a single disk drive system holding up to 500 addresses per diskette, and prints the address list with either one or two addresses across. It includes field for area code and phone number and flexible salutation specification (Mr, Ms, Miss, Mrs, Dr, first name, or default to salutation on softcopy). All fields are fully edited. Price: \$85. Evolution Software, 1632 Bathurst St., Toronto, Canada M5P 3J5, (416) 787-3441.

**CIRCLE INQUIRY NO. 241**

**Information program**, Property Management System, is designed to accommodate the accounting and control requirements of commercial and residential property management. The system can preprint rent receipts, compute late charges, and generate rent increase or delinquency letters automatically. In addition, the system will also calculate charges for common area maintenance, interest on security deposits, and percentage rents when applicable. The system makes possible more efficient accounting methods for both single and multi-fund accounting, including accounts payable, payroll and cash receipts processing. Optional applications that can be added easily without the need for customer programming include: loan amortization, investors payable, HUD reporting, mortgages payable, and mortgages receivable. MAI Basic Four Information Systems Div., Box C-11921, Santa Ana, CA 92771, (714) 731-5100.  
**CIRCLE INQUIRY NO. 242**

**Spelling proofreader**, Spell, is available for CP/M and Heath/Zenith HDOS systems. It detects misspelled words in documents created by most text editors and word processors, including WordStar and Magic Wand. User-engineered flexibility allows the listing of unknown words, marking them in the document for easy editing, or adding them to the dictionary. Effective dictionary size is over 50,000 words with user-expandable prefix/suffix table. The program processes 4,000 input words per minute and requires 48K of RAM. It is available on 8-in. CP/M disk, and 5-in. Heath/Zenith CP/M or HDOS disk. Price: \$49.95, plus \$3 shipping. Software Toolworks, 14478 Glorieta Dr., Sherman Oaks, CA 91423, (213) 986-4885.  
**CIRCLE INQUIRY NO. 243**

**Medical applications package**, Medical Office Management III, includes a full appointment management element, a private patient accounts receivables system and an insurance form preparation system. The system is designed for larger medical practices and features such items as cycle billing and time-of-service insurance compatible billing. The system is designed for an Apple III with 128K of RAM and from one to four Apple SOS operating system

compatible hard or mini-floppy disk drives. Charles Mann & Assoc., Microcomputer Div., 55722 Santa Fe Trail, Yucca Valley, CA 92284, (714) 365-9718.  
CIRCLE INQUIRY NO. 244

**Bill-of-materials** program is an option to GOLD Inventory, designed to provide a multi-level parts explosion with unlimited levels to manufacturers. The system provides a "where used" lookup on a component, a "materials requirements planning report" and will record production in the inventory program. The program is written in CBasic2 and runs on most CP/M systems with hard or floppy disks and comes with source code. Douthett Enterprises, 906 N. Main, Wichita, KS 67203, (316) 262-1040.  
CIRCLE INQUIRY NO. 245

**Project management system**, PMS-II, has been expanded to include two major capabilities. It now provides for the preparation of NET CHANGE reports that compare the current status of a project to a previous status. Gains/losses are calculated and displayed in both calendar and net working days format. The program can accommodate over 1,000 activities per project, making it ideal for many large project control tasks within almost all types of industries. Features include: the ability to calculate a critical path schedule based upon three, four, five, six or seven days per week, while omitting up to 100 holiday periods, coupled with the multiple option REPORT WRITER, GANTT chart processor and cost control. It will run on any microcomputer with Digital Research's CP/M 2.2 operating system and Compiler Systems CBasic2.07. Two 8-in. disk drives and a 132-column printer are required. Price: \$995. North America MICA, 11772 Sorrento Valley Rd., Suite 240, San Diego, CA 92121, (714) 481-6998.  
CIRCLE INQUIRY NO. 246

**Business application package**, The Depreciation Planner, is for use on the Apple microcomputer. It is designed to keep track of depreciable assets for accounting and tax planning purposes. The package incorporates both the previous depreciation methods (to be used for assets purchased before January 1981), as well as the new depreciation methods (to be used for assets purchased after January 1981). It is faster than manual record keeping. It reduces chances of error and alleviates excess paperwork. The user determines cost, salvage amount, useful life, and special restrictions or conditions pertaining to the asset and depreciation method. Once these figures are entered, the program will automatically keep track of each asset. The documentation includes a complete glossary and modeling workbook to introduce users to the concept of depreciation and to give them hands-on experience with the software package. The program will provide significant benefits not only to businesses, but also to accountants. Accountants can use the program to record all assets and depreciation information for their individual clients. Dakin5 Corp., 7475 Dakin St., 4th Fl., Denver, CO 80221, (303) 426-6090.  
CIRCLE INQUIRY NO. 247

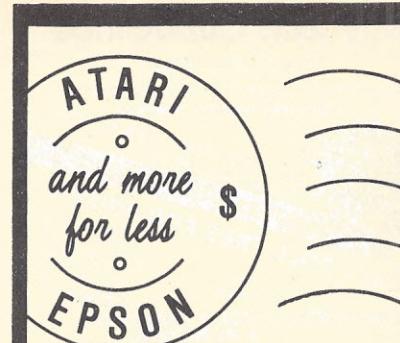
**Word processing package**, Typist, is menu-driven and can be used with any standard CRT and terminal keyboard to add multi-user, shared-logic word processing capabilities to minicomputers that use the company's IRIS operating system. The package offers more than 40 editing functions, including cut and paste, search and replace, abort, move by word, letter or line. Cut and paste cuts a marked section of text and stores it for pasting later. Abort can undo any edits currently stored in memory only. All text is stored on disk, and the program allows for storage and retrieval of sections of text so that a document can be built from previously stored paragraphs. Documents can be stored on any logical unit of an IRIS system; a 16M-byte disk can store more than 4,500 pages of the program's text. Typist gives multi-level security protection, utilizing individual passwords, log verification and encrypt command capabilities. Price: \$2,000. Point 4 Data Corp., 2569 McCabe Way, Irvine, CA 92714, (714) 754-4114.  
CIRCLE INQUIRY NO. 248

**Accounting software packages**, V8 series, is available for the CP/M-enhanced version of the Wangwriter. Packages are now available for general ledger, accounts payable, accounts receivable, payroll, inventory management, sales invoicing and client posting and accounting. All are written in Microsoft Basic, supplied in compiled form and feature the Visionary screen manager. Price for the client posting and accounting package is \$995. Others cost \$595. Management Science America, Suite 1300, 3445 Peachtree Rd. NE, Atlanta, GA 30326.  
CIRCLE INQUIRY NO. 249

**Project Management programs** are designed to aid the engineer or manager in planning, monitoring and controlling projects with multiple activities, resources and varying operational times. This group includes programs on critical path analysis, program evaluation and review technique (PERT), resource allocation and activity on node network analysis. The library of micro-software is tailored to fit the requirements of practicing industrial engineers and managers. All programs are available for the TRS-80, models I and III and also will soon be available for the Apple II systems. Price: \$120 for a set of four programs. IIE Technical Services Dept., 25 Technology Park/Atlanta, Norcross, GA 30092, (404) 449-0460.  
CIRCLE INQUIRY NO. 250

**Accounts payable package** utilizes the computer language, Protege, which is user-oriented to best suit the individual's bookkeeping requirements. Features include special provisions for manually issued checks, a complete audit trail, automatic check printing, flexible methods of payment, vendor purchase history, and facilities to interface with the other accounting systems, such as general ledger, accounts receivable, payroll and invoicing/inventory. Prodigy Systems, 497 Lincoln Highway, Iselin, NJ 08830.  
CIRCLE INQUIRY NO. 251

**N/C program for Apple II**, Arrowcode 15, is a programming language written for mills,



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lathes and punches; consisting of 15 code words that enable the N/C programmer to define part geometry with little or no trig involved, as well as a CRT plot at the time of code-word entry, resulting in a finished N/C Part Program. Features include: complete editing, CRT plot, tool offset, mirror image, pattern rotate, pocketing, bolt holes, threading, parabola, optimizing, shop math, CNC and timeshare compatible. Post processor are available for most N/C Control units. Price: \$1,950. Arrow Data Systems, 5910 E. Washington Blvd., Los Angeles, CA 90040, (213) 726-9440.

CIRCLE INQUIRY NO. 252

Taranto & Assoc., Box 6216, San Rafael, CA 94903, (415) 472-2670.

CIRCLE INQUIRY NO. 255

**Basic compiler**, TASC, for Applesoft Basic programs, converts a standard Applesoft Basic program into machine code, enabling the program to execute much faster than was previously possible. This new tool will allow Apple owners to increase the speed of their Applesoft programs dramatically without having to learn a new programming language. Speed increases range from 2 to 20 times over regular Applesoft programs. The compiler has the ability to compile and run even large, complex Applesoft programs. It also provides powerful Basic language extensions including True Integer Arithmetic, Integer FOR...NEXT, and Chain with COMMON. It requires an Apple II or II Plus, Applesoft Basic, 48K RAM and one disk drive. Microsoft, 400 108th Ave. N.E., Suite 200, Bellevue, WA 98004, (206) 454-1315.

CIRCLE INQUIRY NO. 256

**Cobol compiler**, Level II Cobol, fully implements the following ANSI language modules to the highest specifications (Level II) of the ANSI standards for Cobol: nucleus, table handling, sequential I/O, relative I/O, indexed I/O, interprogram communication and sort/merge. This means that mainframe application programs written to ANSI 74 Cobol standards will be portable to microcomputers with minimal conversion. Micro Focus, 1601 Civic Centre Dr., Santa Clara, CA 95050, (408) 496-0176.

CIRCLE INQUIRY NO. 257

**Information processor**, Servant 3.2, gives any user the ability to store and manipulate information without being bullied by the microprocessor. The system allows any user, regardless of programming or computer knowledge, to use the system through a series of simple prompts. Features include: up to 20 categories of information, graphic instruction, a machine language sort, updating of numeric categories by any percentage, and a text editor with a form letter generator. Other features are present in the eight-moduled system, allowing specialization to the highest degree. Price: \$79.95. The Computer Connection, 13359 Killion St., Van Nuys, CA 91401.

CIRCLE INQUIRY NO. 258

**Labor cost payroll program** is designed for developers, contractors, subcontractors, manufacturers, and any employer requiring full labor costing as a management tool. The program has three fields available for breakout and ultimate testing of hours and dollars. Contractors would use job, building and function. Others might use division or branch, department, function or job assignment. Printouts include paychecks, timecards, check register and recap, (Current, MTD, QTD and YTD totals, including employer's payroll taxes, union costs, worker's compensation and liability insurance), individual job and composite jobcost printouts, and union and state tax report supplements. The labor cost payroll program is written in the popular CBASIC language with disk filing under CP/M. 64K RAM and 2 drives are required. W2s require 132-column printer. The program is mailed on 8-in. single density disk requiring IBM compatibility. Cal Data Systems, 150 Fleker St., Suite B, Santa Cruz, CA 95060, (408) 429-1839.

CIRCLE INQUIRY NO. 254

**Relocatable assemblers**, the Macro-68 for Motorola's 6800 and Macro-18 for RCA's 1802, both run on CP/M-based systems. Each assembler has a powerful macro and conditional assembly syntax and generates an improved Microsoft-compatible relocatable object file. The format even allows the relocation of 8-bit expressions, a capability not previously available. Included with each assembler is a relocatable linking loader and a library manager. Sycon Corp., 4015 Hancock St., San Diego, CA 92110, (714) 222-6381.

CIRCLE INQUIRY NO. 259

**Program generator**, Genesis, accepts commands in conversational English, has almost limitless memory capacity to code

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difficult algorithms and generates efficient code in excess of four lines per second. It runs on all CP/M2.XX systems and uses compiled PL/I-80, although PL/I-80 is not required to run the program. Code is generated in CBasic. The programs comes with on-line documentation and instructions, and a complete, concise printed manual. Developers of this new program generator recommend its use with any disk system with 48K or more. The program comes on standard 5 1/4 or 8-in. disk, with storage sleeve. Price: \$500. Time Management Software, 123 E. Broadway, P.O. Box 727, Cushing, OK 74023, (918) 225-6340.

CIRCLE INQUIRY NO. 260

**Program generator** is for RM/Cobol under CP/M, MP/M, OASIS, MOASIS and UNIX (ONYX hardware). The program allows you to: use your computer to program itself; increase the number of bug-free lines of RM/Cobol programs produced in a given period of time; standardize the code generated and reduce documentation costs; perform experimental "building" of an application system quickly to assist in the definition/specification phase; reduce dependency on highly-skilled programming talent for the many things that can now be done as relatively simple tasks. Price: \$1,500 for CP/M, MP/M and OASIS systems. MOASIS and UNIX (ONYX hardware) prices are \$2,000 and \$2,500, respectively. Cybernetics, 8041 Newman Ave., Suite 208, Huntington Beach, CA 92647, (714) 848-1922.

CIRCLE INQUIRY NO. 261

**RS-232 printer driver** is for the 16K model I, level II, TRS-80 equipped with an RS-232C board. This driver is coded in assembly language and interfaces with the LLIST and LPRINT commands. Serial printers are difficult to support due to their wide variety of functions, features, timing delay requirements, etc. This driver has 16 user-selectable options that allow it to interface to almost any type of serial printer. Options include: form length, pagination, carriage width, null-after-C/R insertion, L/F after C/R insertion, hardware handshake and X-ON/X-OFF recognition. Price: \$35. Micro Systems Software, 3235 Kifer Rd., Suite 32, Santa Clara, CA 95051, (408) 735-1650.

CIRCLE INQUIRY NO. 263

**Optical keyboard** uses interruption of light beams to detect key movement in a patented process involving one-third the parts of a normal keyboard. When an OTI key is pushed, a patented matrix of LEDs and sensors detects the stroke. The optoelectronic components are multiplexed by pulsing the LEDs and scanning the sensors, simultaneously reducing power consumption and component failure rates. Although one LED and one sensor are uniquely associated with each key, the patented matrix achieves an average of at least three keys per LED and sensor. No phantom keys can be detected, and N-key rollover becomes an easily achieved feature. Standard OTI keyboards with 94 keys are available immediately. Prototypes of custom models are available 90 days after receipt of purchase orders and specifications. Optical Techniques, 1800

E. Garry, Suite 219, Santa Ana, CA 92705, (714) 540-9040.

CIRCLE INQUIRY NO. 270

**Fast floating point**, 68343, supports the MC68000 microprocessor. It performs arithmetic, transcendental and conversion operations for single precision (32-bit) floating point numbers. These operations are subroutines that simply use MC68000 code in an efficient manner. This code is optimized to a high degree, allowing floating point operations to execute in software, in many cases faster than hardware floating point co-processors and units. To use the software, no special hardware is required, no special traps need be accounted for, no interconnects are needed to other components, no additional board space is consumed and the additional costs are negligible. Either all of the routines, or just those that will be typically used in the customer's end system, can be included in the system's library files called at any time by either the operating system, applications programs, or user programs. Routines are all relocatable and position independent. The only system requirements are an MC68000 to execute code. Price: \$495. Motorola, MOS Integrated Circuits Div., 3501 Ed Bluestein Blvd., Austin, TX 78721, (512) 928-6845.

CIRCLE INQUIRY NO. 264

**Listing and cross-reference generator**, BPSXREF for Microsoft's Basic-80 5.x language, will produce a formatted listing and an alphabetized list of program variables and function cross-referenced to the line numbers where they are used. The formatted listing allows for page titles, page numbers and skipped lines for added clarity in program documentation. A variety of options allow the user to decide whether he wants a simple listing or only a detailed cross-reference, or some combination of listing and cross-reference. The generator operates on ASCII-formatted CP/M files as produced by MBasic's SAVE command with the "A" option, or text editors such as Ed, Wordmaster and Mince. This is the same file format required by Microsoft's Basic compiler, Bascom. This tool is a benefit to programmers who are developing complex application systems in the Microsoft Basic language. It provides a convenient documentation tool for a language notorious for its lack of programming discipline and documentation. It requires a 48K CP/M-compatible operating system. Price: \$124. BPS, 82 Woods End Rd., Fairfield, CT 06430, (203) 254-1659.

CIRCLE INQUIRY NO. 262

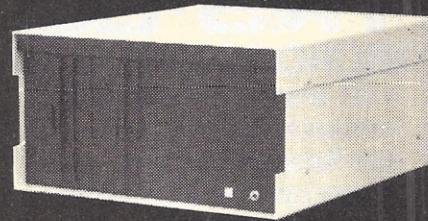
**Remote communications package**, Intercom, for the CP/M operating system is available for Zenith, Radio Shack model II, Cromemco, Ohio Scientific and Apple II computers. The package (written in 8080 code) is designed for interactive communications as well as verified quantity file transfers (including object files) using several standard protocols. Other features include four auto-sign-on routines, four user-definable routines, batch mode for unattended operation, CP/M system level commands including directory with disk space utilization. Price: \$75. End of File,

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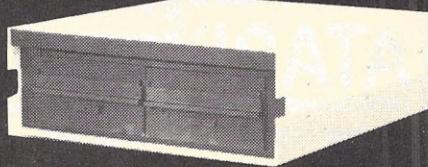
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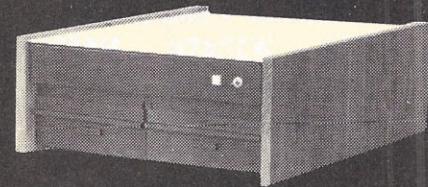
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CIRCLE INQUIRY NO. 265

**Outpost** features eight levels of play and several convenient features, such as user-defined keys, sound on/off toggle, escape for temporary interruptions of the game, and a restart function. The game requires an Apple II with 48K and one disk drive. It is compatible with the Joyport program. Price: \$29.95. Sirius Software, 2011 Arden Way #2, Sacramento, CA 95825, (916) 920-1939.

CIRCLE INQUIRY NO. 266

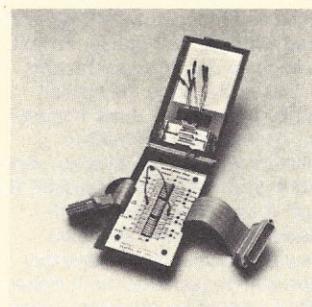
**Precision soldering irons, PT series,** eliminate P.C. board damage caused by excess heat build-up of nichrome and ceramic heater soldering irons. The irons heat up to the optimum soldering temperature (260 C (500 F) - 300 C (572 F)) in just one minute. The irons also



feature quick temperature recovery. They use only 15-20W in operation and less than 10W idling. Goot Soldering Irons and Accessories, 2305 W. Victory Blvd., Burbank, CA 91506.

CIRCLE INQUIRY NO. 267

**RS-232 I/O line tester** can save users time and expense by pinpointing signal discrepancies. The pocket-size device connects between the user's equipment

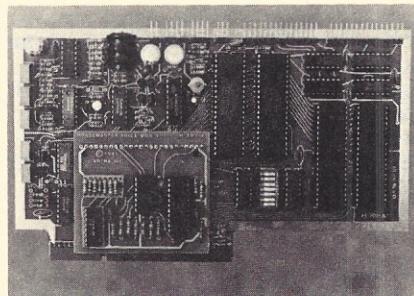


and the communication line to differentiate 12 different signals. Interface pins can be cross-patched with the tester's connection jumper wires to test and correct problems. It cuts repair costs by helping users pinpoint transmission difficulties before a technician is called. LEDs monitor the following signals: TS (2), RD (3), RTS (4), CTS (5), DSR (6), DCD (8), TC (15), RC (17), DTR (20), SQ (21), RI (22), and Busy (25). Price: \$199. Inmac, 2465 Augustine Dr., Santa Clara, CA 95051.

CIRCLE INQUIRY NO. 268

**Printed circuit card** for the H-89, Housemaster, provides the system with four separate peripherals on a single

printed circuit card. These include voice recognition, stereo sound synthesis, a real-time clock/calendar, and a BSR-X-10 home control interface. Available options are a battery backup for the clock, two types of voice synthesis and two RS-232 serial



ports. All options mount on the same board. A full disk of 17 programs is provided, along with a 90-page manual. The programs are written in either Basic or Assembly language and demonstrate all of the features on the board. Prices: \$299 for the kit and \$399 for the assembled, calibrated and tested version. Artra, Box 653, Arlington, VA 22216, (703) 527-0455.

CIRCLE INQUIRY NO. 269

**4K CMOS RAM**, the MP6504, is a pin-for-pin replacement for the Harris HM6504 RAM. It has a true standby supply current value of only 1 μA and while in the idle or non-switching state the value is only 40 μA (maximum). These low-power values are achieved through the use of a High Density Silicon Gate CMOS process. It has a 4096 by 1 memory configuration, and 250nS access time, interfaces with a number of microprocessors, and is pin-compatible with the industry standard 6505. These devices are ideal for nonvolatile storage with battery backup. Each device is powered from a single +5V supply. Data is retained even when power drops to as low as 2V. The absolute maximum voltage of 7 volts allows for four, fully-charged, 1.5V batteries in portable product applications. The 100-piece price is \$6.25. Micro Power Systems, 3100 Alfred St., Santa Clara, CA 95050, (408) 247-5350.

CIRCLE INQUIRY NO. 270

**Synergizer** provides Apple users with advanced capabilities: CP/M compatibility, expanded RAM, 80-column display, and increased word processing software compatibility. It consists of a powerful implementation of the CP/M operating system and three peripherals: Smarterm, a powerful 80-column display board; Z-Card, ALS's Z-80A processor for the Apple to provide the full range of CP/M capabilities for both the Apple II and Apple III; and Add-Ram, the 16K RAM board that permits addressing of the full memory supported by the Z80A processor (and the 6502 in the Apple). Price: \$749. ALS, 1195 E. Arques Ave., Sunnyvale, CA 94086, (408) 727-6805.

CIRCLE INQUIRY NO. 272

**Memory module**, CI-PCM, was designed using 64K-bit NMOS dynamic RAM technology. The module requires only one I/O expansion slot for 256K bytes of memory. The CI-PCM generates and checks parity with Interrupt totally IBM-

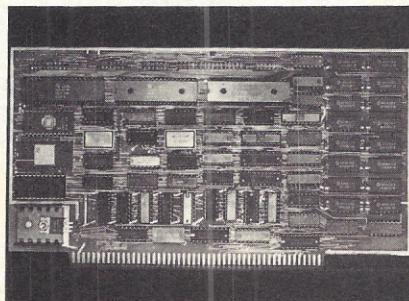
compatible. It is addressable in 64K-byte increments throughout the 1M-byte address field of the IBM Personal Computer. The



memory has an access time of 225 nS and a cycle time of 400 nS with a totally current requirement of under 1 amp from the system 5 volt power supply. It is available in 64K, 128K, 192K, and 256K-byte configurations. Delivery is stock. Price: \$1,150 for the 256K-byte option. Chrislin Industries, 31352 Via Colinas #102, Westlake Village, CA 91361, (213) 991-2254.

CIRCLE INQUIRY NO. 273

**I/O board**, SBC-I, contains a CPU, two serial ports, two parallel ports, and 128K bytes of user RAM all on one IEEE S-100 unit. Capable of operating as a slave on the S-100 bus in a high performance multi-processing system, the board can also be implemented as a stand-alone single board computer in a network environment. Because each user has his own CPU, the addition of other users in the system causes far less speed degradation than in currently available timesharing multi-user systems. SBC-I has memory management hardware that allows the on-board Z-80A (optionally Z-80B) to directly address 128K bytes in 4K segments. This circuit opens up a wide world of possibilities in operating systems and applications software. In addition to user RAM, there is provision for up to 8K of on-board EPROM to be used for initialization routines. The 2716/32/64 device can be disabled by software after the initialization process is completed. The S-100 bus interface is via a 1K or 2K-byte



FIFO allowing efficient communication to the system master. SBC-I appears as a set of I/O ports to the bus master and is fully IEEE-696 S-100 compatible. The two serial ports allow full RS-232C compatible communication up to 19,200 baud or optionally a high speed RS-422 interface. In addition, the interface for a synchronous modem has been provided. Teletek, 9767F Business Park Dr., Sacramento, CA 95827, (916) 361-1777.

CIRCLE INQUIRY NO. 274

# CP/M® SOFTWARE

For The Small Computer System

NEW PRICES  
NEW SOFTWARE

## ACCOUNTING

	IMS	\$540	\$40	1.7	COMPLETE MANUAL ONLY	SYSTEM REQUIRE- MENTS
ACCOUNTS RECEIVABLE (B/F)	IMS	540	40	1.7		
ACCOUNTS RECEIVABLE (O/I)	IMS	540	40	1.7		
ACCOUNTS PAYABLE	IMS	540	40	1.7		
PAYROLL	IMS	540	40	1.7		
JOB ACCOUNTING	IMS	540	40	1.7		
FUND ACCOUNTING	IMS	540	40	1.7		
CASH RECEIPT/DISBURSEMENT	IMS	200	40	1.7		
DEPRECIATION SCHEDULE	IMS	100	40	1.7		

## GENERAL BUSINESS SYSTEMS

	MFG. INVENTORY CONTROL	IMS	\$600	\$75	1.7	
WHOLESALE/RETAIL DISTRIBUTION	IMS	600	75	1.7		
MEDICAL/DENTAL SYSTEM	IMS	600	75	1.7		
STUDENT RECORDS/SCHEDULING	IMS	540	50	1.7		
PROPERTY MANAGEMENT	ASC	1095	75	1.7	12	
PROPERTY MANAGEMENT	A-T	640	50	1.7		
PROPERTY ANALYSIS SYSTEM	A-T	245	50	1.7		
INSURANCE AGENCY SYSTEM	Univar	940	75	1.7	9	
MONEY MAESTRO-HOME BANKING	InnSofts	190	25	1		
WIREMASTER	Afterthought Eng.	140	25	2.17		

## MODELING, PLANNING & ANALYSIS

	MINI MODEL™	Financial Plan Assoc.	\$490	\$60	1.7	
STATPAK	Northwest Analytical	490	50	1.8		
SHORTAX	Syntax	490	40	2.5	8	
MICROSTAT	Ecosoft	290	25	1.5		
SUPERCALC™	Sorcom	285	—	1.6		
CALCSTAR™	Micro-Pro	250	60	5		
muSIMP/muMATH	Microsoft	245	30	2.5		
WORKSHEET	SoHo Group	200	30	1.9	7 or 8	
TARGET™ PLANNER	AMS	195	50	4.5		
FORECASTER	Software Establishment	145	45	2.5	7.9	

## TIME, BILLING & SCHEDULING

	LEGAL TIME ACCOUNTING	Univar	\$945	\$60	1.7	9
LEGAL BILLING & TIMEKEEPING	Microcraft	650	60	1.7	9	
PROFESSIONAL TIME ACCOUNTING	Asyst	590	40	1.7	9	
CLIENT BILLING	Serendipity	590	40	1.7	9	
DATEBOOK II™	Organic Software	290	40	1.9		
MILESTONE™	Organic Software	290	40	1		

## LANGUAGES

	µAPL	Softronics	\$345	\$50	2.5	
BASIC COMPILER	Microsoft	350	—	2.5		
BASIC - 80	Microsoft	325	—	2.5		
S - BASIC™	Topaz	290	35	2		
CBASIC - 2™	Digital Research	120	35	5		
CB80™	Digital Research	490	35	5		
CBASIC-86™	Digital Research	325	35			
TINY C - II	Tiny C Assoc.	245	50	2.5	13	
TINY C	Tiny C Assoc.	100	50	2.5	13	
C-COMPILER	Supersoft	195	25	2.5		
COBOL - 80	Microsoft	690	—	2.5		
NEVADA COBOL	Elis	190	30	2.5		
FORTH	Supersoft	195	30	2.5	12	
FORTH (Z80)	Lab Microsystems	45	25	2.6		
FORTRAN - 80	Microsoft	430	—	2.5		
FORTRAN IV	Supersoft	245	30	2.5	17	
RATFOR	Supersoft	95	—	13		
muLISP/muSTAR-80	Supersoft	200	25	2.5		
TINY PASCAL	Ithaca	390	40	3.17		
PASCAL Z	Digital Research	485	60	3.6		
PASCAL MT +™	Digital Research	370	35	3.12		
PASCAL M™	Sorcom	490	50	2.6		
PLT - 80™	Digital Research	490	50	2.6		

## MAILING LIST

	POSTMASTER	Teratec	\$145	\$25	2.5	7
MAIL - MERGE™ FOR WORDSTAR	Micropro	130	30	5.7		
NAD	Structured Systems Group	110	25	2.5	19	
SUPER - M - LIST	Supersoft	100	25	2		

## TELECOMMUNICATIONS

	ASCOM	DMA	\$170	\$25	9	
TERM	Supersoft	145	25	2.13		

## ENTERTAINMENT

	NEMESIS	Supersoft	\$40	\$15	2.5	10
ANALIZA II	Supersoft	50	—	2.67		

## \* \* \* \* \*

## ORDER INFORMATION

- CAL TOLL FREE 800 538-3160
- CALIF (408) 996-8560
- OVERSEAS AND C.O.D.—ADD \$10 + SHIPPING/HANDLING
- SHIPPING/HANDLING—ADD \$3.00 PER ITEM
- CALIF. RESIDENTS—ADD 6 1/2% SALES TAX
- PAYMENT BY PREPAY CHARGE OR CREDIT ORDER, UPS C.O.D.
- ALL ITEMS SUBJECT TO AVAILABILITY
- ALL PRICES SUBJECT TO CHANGE WITHOUT NOTICE
- ALL ORDERS SHIPPED UPS, F.O.B. SAN JOSE
- MOST DISK FORMATS AVAILABLE
- MANUAL ORDERS WILL BE APPLIED TO SOFTWARE PURCHASES WITHIN 90 DAYS
- THE SALE OF EACH SOFTWARE CONVEYS A LICENSE FOR USE ON ONE SYSTEM ONLY

## \* \* \* DISCOUNTS \* \* \*

- IMS CHECKED ( ) ITEMS—BUY TWO CHOOSE A THIRD ONE FREE
- CHOOSE 1 BOOK LISTED FOR EACH ITEM ORDERED OVER \$200

## WORD/TEXT PROCESSING

SPELLBINDER™	Lexisoft	\$490	\$50	2.5, 9.14
BENCHMARK™	Metasoft	480	—	2.6
WORDSTAR™	Micropro	440	60	5.9, 10
SPELLGUARD™	ISA	285	25	2.5, 14
SPELLSTAR	Micropro	240	30	5.14
MINCE	Unicom	140	30	2.5, 10
SCRIBBLE	Unicom	140	30	3.5, 10
WORDMASTER	Micro-Pro	130	40	5.10
TEXTWRITER III™	Organic Software	120	40	2.5, 14
TEX	Digital Research	100	20	5

## DATA/FILE MANAGEMENT

FMS-80	System Plus	\$975	\$60	1.9
CONDOR - II	Condor Computer	940	50	1
ACCESS-80	Friends Software	780	50	3.5
dBASE II	Ashton-Tate	680	50	1.9
PEARL 3	Computer Pathways	540	50	2.7, 19
SELECTOR V	Micro-Ap	485	50	1.3, 10
T.I.M. III	Innovative Software	640	50	1.15
DATASTAR™	Micropro	340	60	5.10
SELECTOR IV™	Micro-Ap	285	50	1.3, 17
MICRO B +	Fair Com	255	30	2.16
ANALYST	Structured Systems Group	240	25	1.79
BT-80™	Digital Research	200	30	6
FABS	Computer Control	190	25	
WHAT'SIT™	Computer Headware	170	30	2.57

## SOFTWARE DEV TOOLS/UTILITIES

ZSID	Digital Research	\$100	\$25	5
MAC	Digital Research	90	25	5
SID	Digital Research	75	25	5
DESPPOOL	Digital Research	50	—	5
XTL86™	Digital Research	150	15	
MACRO - 80	Microsoft	195	—	2.5
EDIT - 80	Microsoft	110	—	2.5
IBM2CPM	Precision Comp. System	100	—	2.5
VEDIT	CompuView Products	140	30	2.5
DISK DOCTOR	Supersoft	95	20	2
DIAGNOSTIC II	Supersoft	95	25	2
FILE INDEX	Fisher	25	—	

## SORTING

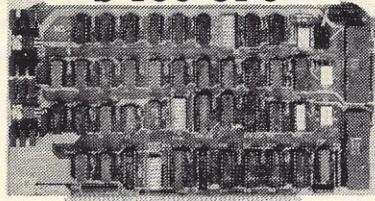
SUPERSORT I™	Micropro	\$220	\$60	5
ULTRASORT II™	Computer Control	150	25	7

## CP/M

CP/M 2 - TRS 80 MODEL II™	P.T.	\$185	\$40	
CP/M - TRS 80 MODEL III™	Far North Systems	250	40	2.11
CP/M 80 APPLE SOFTCARD	Microsoft	335	—	2

## BOOKS

CP/M HANDBOOK	Syber	\$14.95		
CP/M USERS GUIDE	Osborne	12.99		
CP/M PRIMER	Sams	11.95		
HOW TO GET STARTED WITH CP/M	Dilithium	10.95		
USING CP/M - SELF TEACHING	Wiley	10.95		
CP/M SUMMARY GUIDE	Rainbow	6.95		
MICRO BASIC	Dilithium	12.95		
FIFTY BASIC EXERCISES	Syber	12.95		
BASIC PRIMER	Sams	10.95		
BASIC BUSINESS SOFTWARE	Sams	9.95		
MICROFORT	Dilithium	15.95		
PASCAL PRIMER	Sams	16.95		
PASCAL HANDBOOK	Syber	14.95		
PASCAL USERS MANUAL AND REPORT	Jenson Wirth</td			

**S-100 CPU****CPU-Z - GODBOUT**

2/4 MHZ Z80 CPU 24 Bit Addressing

WOW!

PART NO.	DESCRIPTION	LIST PRICE	OUR PRICE
IDGBT160A	A & T	\$295.00	\$199.00
IDGBT160C	CSC 3-6 MHZ	\$395.00	\$375.00

**DUAL PROCESSOR 8085-8088 - GODBOUT**

6 or 8 MZ Provides true 16 Bit Power with a standard 8 bit S-100 bus.

IDGBT1612A	A & T 6 MHZ	\$425.00	\$399.00
IDGBT1612C	CSC 6/8 MHZ	\$525.00	\$498.00

**SOLID STATE DISK DRIVE, 3500% FASTER!**

Not Really, But the Next Best Thing For Godbout 8085/88 Users. Call for Details on M-Drive. See Page 340 of November BYTE

IDGBT MD 128K		\$1,550.00
IDGBT MD 256K		\$3,000.00

**2810 Z80 CPU-CA. COMP. SYST.**

2/4 MHZ Z80A CPU with RS232C Serial I/O Port complete with Monitor PROM for 2422 Disk Controller

IDCCS2810A	A & T	\$350.00	\$280.00
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**CB2 Z80 CPU - S.S.M.**

2/4 MHZ will accept 2716, or 2732, or RAM RUN/STOP and single step switches

IDSSMCB2K	Kit	\$260.00
IDSSMCB2A	A & T	\$344.00
IDSSMZ80M	SSMZ80 Monitor	\$89.00

**CBIA 8080 CPU - S.S.M.**

8080 CPU, 1K RAM, Holds 1 2708, 1 Bit parallel input port.

IDSSMBCB1K	Kit	\$183.00
IDSSMBCB1A	A & T	\$252.00
IDSSM8080M	SM 8080 Monitor	\$59.00

**S-100 I/O BOARDS****SYSTEM SUPPORT 1 - GODBOUT**

Serial port (software prog baud), 4K EPROM OR RAM provision, 15 levels of interrupt, real time clock, optional math processor

PART NO.	DESCRIPTION	LIST PRICE	OUR PRICE
IDGBT162A	Assembled & Tested	\$399.00	\$360.00
IDGBT162C	CSC	\$495.00	\$460.00
IDGBT2831	Math Chip	\$195.00	\$195.00
IDGBT2832	Math Chip	\$195.00	\$195.00
IDGBT162AM1	A&T with 8231 Math Chip	\$555.00	\$555.00
IDGBT162CM1	CSC with 8231 Math Chip	\$655.00	\$655.00
IDGBT162AM2	A&T with 8232 Math Chip	\$555.00	\$555.00
IDGBT162CM2	CSC with 8232 Math Chip	\$655.00	\$655.00

**MPX CHANNEL BOARD - GODBOUT**

I/O Multiplexer, using 8085A-2 CPU on board

IDGBT166A	A & T	\$495.00	\$450.00
IDGBT166C	CSC	\$595.00	\$550.00

**INTERFACER I - GODBOUT**

Two Serial I/O

IDGBT133A	A & T	\$249.00	\$219.00
IDGBT133C	CSC	\$324.00	\$298.00

**INTERFACER II - GODBOUT**

Three parallel, one serial I/O board

IDGBT150A	A & T	\$249.00	\$219.00
IDGBT150C	CSC	\$324.00	\$289.00

**INTERFACER III - GODBOUT**

Eight channel multi-use serial I/O board

IDGBT1748A	A & T	\$699.00	\$629.00
IDGBT1748C	CSC 200 hr. Burn In	\$849.00	\$750.00

**INTERFACER 3 WITH 5 SERIAL PORTS**

IDGBT1745A	A & T	\$599.00	\$559.00
IDGBT1745C	CSC 200 hr. Burn In	\$699.00	\$629.00

**MULTI I/O - MORROW DESIGNS**

Three Serial, Two parallel

IDMDSMB320A	A & T	\$359.00	\$329.00
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**SWITCHBOARD - MORROW DESIGNS**

Two serial I/O, four parallel I/O,

IDMDSSB2411	one status port, one strobe port	\$299.00	\$269.00
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**I/O4 - SSM**

Two serial I/O, two parallel I/O

IDSSMID04K	Kit	\$210.00
IDSSMID04A	A & T	\$290.00

**I/O5 - SSM**

2 Serial, 3 Parallel including 1 Centronics

IDSSMI051	A & T	\$329.00	\$309.00
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**I/O8 - SSM**

8 Port Serial I/O with Timer

IDSSMI08A	A & T	\$550.00	\$495.00
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**2710 4 PORT SERIAL - CCS**

4 Full handshaking RS232 ports and optional 2K ROM

IDCCS271001	A & T	\$360.00	\$310.00
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**2718 2 SERIAL & 2 PARALLEL - CCS**

2 RS232 C ports, 2 8 bit parallel ports, &amp; optional 2K ROM

IDCCS271801	A & T	\$360.00	\$325.00
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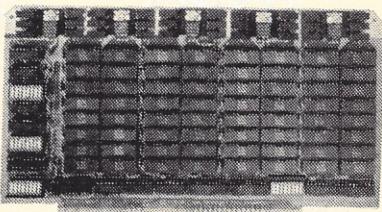
**2720 4 PORT PARALLEL - CCS**

4 8 bit parallel ports and optional 2K ROM

IDCCS272001	A & T	\$250.00	\$225.00
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**S-100 10 MHZ STATIC RAM**

NEW LOW PRICES!

**RAM 20 - 32K  
SALE \$299.00**

RAM 20 10 MHZ, 4K byte block disable, bank select or 24 bit addressing available 8, 16, 24 or 32K

PART NO.	DESCRIPTION	LIST PRICE	OUR PRICE
IDGBT164AA8	8K A&T	\$210.00	\$190.00
IDGBT164AC8	8K CSC	\$280.00	\$260.00
IDGBT164AA16	16K A&T	\$285.00	\$260.00
IDGBT164AC16	16K CSC	\$355.00	\$325.00
IDGBT164AA24	24K A&T	\$355.00	\$325.00
IDGBT164AC24	24K CSC	\$425.00	\$385.00
IDGBT164AA32	32K A&T	\$425.00	\$299.00
IDGBT164AC32	32K CSC	\$495.00	\$450.00

**CMOS STATIC RAM**

For a complete analysis of the advantages of CMOS memory, see the "Product Description" on page 416 of the January Issue of BYTE.

**64K CMOS STATIC RAM - GODBOUT**

RAM 17, 10 MHZ, 2 Watt, DMA Compatible

24 Bit Addressing

PART NO.	DESCRIPTION	LIST PRICE	OUR PRICE
IDGBT175A48	48K A&T	\$650.00	\$619.00
IDGBT175C48	48K CSC 200hr.	\$750.00	\$710.00
IDGBT175A64	64K A&T	\$795.00	\$755.00
IDGBT175C64	64K CSC 200hr.	\$895.00	\$850.00

**NEW! 32K x 16 BIT CMOS STATIC RAM - GODBOUT**

RAM 16 10 MHZ, 32K x 16 or 64K x 8

IEEE/696 16 BIT 2 Watt, 24 Bit Addressing

PART NO.	DESCRIPTION	LIST PRICE	OUR PRICE
IDGBT180A	64K A&T	\$895.00	\$850.00
IDGBT180C	64K CSC	\$995.00	\$945.00

**NEW! 128K NMOS STATIC RAM - GODBOUT**

RAM 21 10 MHZ 128K X 8 64K x 8

IEEE/696 8 or 16 Bit 2 Amps 24 Bit Addressing

PART NO.	DESCRIPTION	LIST PRICE	OUR PRICE
IDGBT167A	128K A&T	\$1695.00	\$1610.00
IDGBT167C	128K CSC	\$1895.00	\$1795.00

**S-100 PROM****PBI PROM PROGRAMMER - SSM**

Programs 2708 or 2716's, operates as a

4K/8K EPROM BOARD AS WELL.

PART NO.	DESCRIPTION	LIST PRICE	OUR PRICE
IDSSMPB1K	Kit	\$179.00	
IDSSMPB1A	A & T	\$265.00	\$220.00

**ECONOMER 2708 - GODBOUT**

16K x 8 EPROM Board using 2708, Power on

jump to any 256 byte

PART NO.	DESCRIPTION	LIST PRICE	OUR PRICE
IDGBT125A	A & T	\$135.00	\$120.00
IDGBT125C	CSC	\$195.00	\$175.00

**MB8A - SSM**

1K/16K 2708 EPROM board, disable in 1K increments

PART NO.	DESCRIPTION	LIST PRICE	OUR PRICE
IDSSMMB8AK	Kit	\$114.00	
IDSSMMB8AA	A & T	\$179.00	\$159.00

**S-100 VIDEO BOARDS****SPECTRUM - GODBOUT**

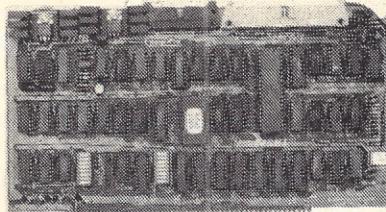
Color Graphics board with Parallel I/O

PART NO.	DESCRIPTION	LIST PRICE	OUR PRICE

<tbl\_r cells="4" ix="1" maxcspan

# PRIORITY ONE ELECTRONICS

## GODBOUT DMA DISK 1 WITH FREE CPM 2.2 SALE \$450.00



**SAVE \$220.00**

Priority 1 Electronics is pleased to offer the GODBOUT DISK 1 High Performance Disk Controller at our regular low price with CP/M 2.2 and BIOS at no additional cost. That's a savings of \$220.00 of the manufacturer's list price.

- Third generation INTEL 8272/NEC 765A LSI floppy disk controller.
- High speed cycle stealing DMA interface for processor independent data transfer between system memory and flexible disk.
- Handles up to four 8 or 5.25 inch floppy disk drives
- Single or double density/single or double sided capability.
- Supports IBM 3740 soft sectored formats.
- 24 bit DMA addressing with data transfer across 64K boundaries for data transfer throughout the 16Mbyte memory map.

Part No.	Description	List Price	Our Price
IDPDBT171ACPM	A&T w/CP/M 2.2 & BIOS	\$670.00	<b>\$450.00</b>
IDGBT171C	CSC	\$595.00	<b>\$555.00</b>
IDGBTCPM80*	CP/M 2.2 for Z80/8085 with manuals & BIOS 8" S/D disk	\$175.00	
IDGBTDA88S	Oasis 8 bit single user 8" S/D disk	\$500.00	
IDGBTDA88M	Oasis 8 bit multiuser, 8" S/D disk	\$850.00	

## S-100 SYSTEMS

### SUPERSIXTEEN — GODBOUT

HERE IS WHAT EACH PACKAGE INCLUDES:

IDGBT1612A 6 MHz 8085/8088 Dual Processor Board  
IDGBT171A High Speed DMA Disk Controller  
IDGBT162A System Support 1 Multi-Function Board  
IDGBT133A Interfacer 1 Dual Serial I/O  
ID128K 10MHz Low Power Static Ram  
IDGBTCP/M 86 16 Bit Operating System Ready to Load & Go  
Cables and Documentation Three interfacercables one disk I/O cable, complete documentator for all hardware, and manuals for both CP/M operating systems.  
Compu Pro's famous 1 Year limited warranty.

Now to the best part of all. If purchased separately, these quality components would list for \$4,344.00. BUT Supersixteen's low package price is an amazing \$3,495.00. You save \$849.00! (For boards qualified under the Certified System Component high-reliability program - with extended 2 year warranty, 200 hour burn-in and 8 MHz processors - add \$600.00 to the package price.) Sh. Wt. 15 lbs.

IDPBBGBT SJ SuperSixteen A&T \$3495.00  
IDPBBGBT SK SuperSixteen CSC \$4095.00

## PRINTERS

**BEST  
PRICE!**



## MICROLINE — OKIDATA WITH FRICTION AND TRACTOR FEED

• BI-DIRECTIONAL - 120 CPS • Parallel and Serial I/O  
• 9x9 Matrix (Alphanumeric) • 100 Thru 1200 Baud  
• 6x9 or 12 Matrix for Graphics • Self Test  
• 5,8,3,10,16 Characters/inch • Out of Paper Switch  
• 6 or 8 Lines per Inch • Friction or Tractor Feed  
• 80 CPL@10 CPI for 82A • 3" to 14" Top of Form  
• 132 CPL@10 CPI for 83A • (Switch Selectable)  
• 10 Different Character Sets

Part No.	Description	List Price	SALE PRICE
IDOKIDAT82AT[26 lbs]8	80 CPL @ 10 CPI	\$ 799.00	<b>\$39.00</b>
IDOKIDAT83AT [37 lbs]132 CPL @ 10 CPI	\$1195.00	<b>\$750.00</b>	
IDOKISER2KB	9600 baud with 2K Serial Buffer upgrade with X-on Y-off	\$159.00	
IDOKIGRAPH	High Resolution Graphics Prom	\$99.00	

## MX80 — EPSON NEED WE SAY MORE?

IDEPNMX80	Tractor Feed 17 lbs	\$645.00	<b>\$450.00</b>
PRINTER INTERFACES - MICROBYTE	RS232 Serial Conversion for MX80	\$55.00	
IDMBSEII	A & T	\$55.00	
Apple Centronics 8 bit parallel interface for Centronics, Epson & OKIDATA printers			
IDMBSAEII	A & T	\$55.00	
IDMBSAEI	Cable for above	\$14.95	
Printer interfaces & cables sold only with printer purchase			

## S-100 MAINFRAMES



### S-100 MICROFRAME - TEI

110V 60HZ CVT Mainframes, the best money can buy!

12 Slot ±8V 17A±16V @ 2A  
22 Slot ±8V @ 30A± 16V @ 4A

Part No.	LIST PRICE	OUR PRICE
IDTEIMCS 112	12 Slot Desk	\$685.00 <b>\$615.00</b>
IDTEIMCS 122	22 Slot Desk	\$825.00 <b>\$760.00</b>
IDTEIRM 12	12 Slot Rackmount	\$725.00 <b>\$720.00</b>
IDTEIRM 22	22 Slot Rackmount	\$875.00 <b>\$850.00</b>

Shipping Weight: On 12 Slot Mainframe 45 lbs.  
On 22 Slot Mainframes 55 lbs.

### TEI S-100 FRAMES

#### 3 - 5" DISK CUTOUTS

±8V @ 17±16V @ 1.2A, Internal Cables

Part No.	LIST PRICE	OUR PRICE
IDTEITF12	12 Slot desk	\$675.00 <b>\$625.00</b>
IDTEITF12	12 Slot Rackmount	\$795.00 <b>\$715.00</b>

Shipping Weight: On 12 Slot Desk 40 lbs.

On 12 Slot Rackmount 45 lbs.

### DUAL 8" DISK DRIVE CHASSIS - TEI

For Shugart 800/801R or 850/851R with internal power cables provided

+24V @ 1.5A+5V @ 1.0A - 5V @ .25A

Part No.	LIST PRICE	OUR PRICE
IDTEIDF00	Desk Top	\$535.00 <b>\$485.00</b>
IDTEIRF00	Rack Mount	\$720.00 <b>\$670.00</b>
IDPDBDFD051	DFDO with 1 Shugart 801R	\$970.00
IDPDBDFD052	DFDO with 2 Shugart 801Rs	\$1375.00
IDPBRDFD051	RFDO with 1 Shugart 801R	\$1095.00
IDPBRDFD052	RFDO with 2 Shugart 801Rs	\$1495.00
IDPR150PCCE2	Internal Data Cable .50 pin plug connector to 2 Card Edge	\$34.95

Due to UPS shipping regulations, disk drives will be shipped separately from the cabinet. Don't forget to include shipping for each drive. (Shipping Weight, 16 lbs each.)

CALL FOR NEW TEI PRICES MARCH 1st

### S-100 MAINFRAME - GODBOUT

110V 60HZ CVT Mainframe uses famous 20 slot

GODBOUT Motherboard. 55 lbs.

IDGBTENC20RM 20 Slot Rack Mount \$895.00 **\$825.00**

IDGBTENC20DK 20 Slot Desk Top \$825.00 **\$760.00**

### S-100 MAINFRAME - CCS

12-slot motherboard with removable termination card  
IDCCS220001 Office Cream 35 lbs \$575.00 **\$535.00**  
IDCCS220002 Blue 35 lbs \$575.00 **\$535.00**

### SOFTWARE - MICROPRO

All software is supplied on 8" Single Density IBM 3740 CP/M Compatible Diskettes  
WORDSTAR

Screen-Oriented, integrated word processing system specifically designed for non-technical personnel  
IDMPRWRS1AT \$495.00 **\$300.00**

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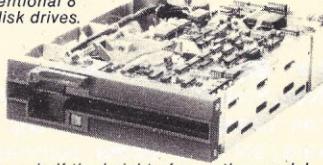
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# CALENDAR

**Apr 2-4 Eighty/Apple Computer Show**, Statler Exposition Hall, New York, NY, featuring exhibitors selling products and services related to the TRS-80 and Apple systems, including hardware, software, books, supplies and magazines. Also to feature seminars and technical sessions for both systems. Kengore Corp., 3001 Route 27, Franklin Park, NJ 08823, (201) 297-2526.

**Apr 4-7 Deltak International Training Conference/Access '82**, Hyatt Regency, Chicago, IL, will feature 35 workshop sessions with EDP trainees and professionals. Keynote speaker: Gerald R. Ford. Corporate Communications Assoc., 799 Roosevelt Rd., Building 6, Suite 315, Glen Ellyn, IL 60137, (312) 790-1225.

**Apr 5-7 Office Automation Conference**, Moscone Center, San Francisco, CA, featuring over 600 booths demonstrating all types of office machine equipment. Seminars in banking, manufacturing, educational institutions, energy-related firms, insurance carriers, independent insurance agents, and defense-related government agencies. OAC '82 Registration, AFIPS, Box 9659, Arlington, VA 22209.

**Apr 13-14 Computer Network Performance Symposium**, University of Maryland, College Park, MD, focusing on theoretical and practical aspects of measuring and evaluating package-switch networks, computer vendors, network archi-

tures and local area networks. Mitre Corp., W-701, 1820 Dolley Madison Blvd., McLean, VA 22102, (703) 827-6394.

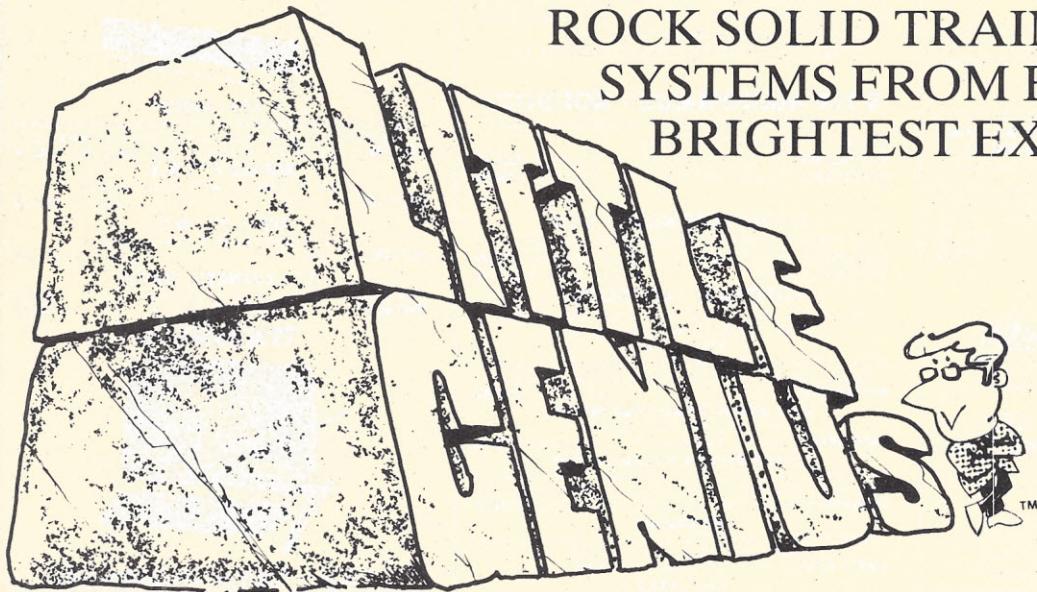
**Apr 16-17 Virginia Computer Users Conference**, Marriott Inn, Blacksburg, VA, topics will include artificial intelligence, office automation, and data base management. Virginia Polytechnic Institute and State University Student Chapter, 562 McBryde Hall, Blacksburg, VA 24061, (703) 961-6931.

**Apr 17-18 Trenton Computer Festival**, State College, Trenton, NJ, exhibitions and demonstrations on software and hardware. Dr. Allen Katz, Dept. of Engineering Technology, Trenton Computer Festival, Trenton State College, Hillwood Lakes CN550, Trenton, NJ 08625.

**Apr 20-23 Technical Meeting and Equipment Exposition**, Marriott Hotel, Atlanta, GA, includes four seminars discussing: engineering methods, environmental stress impact, contamination control, energy, and the environment. Betty L. Peterson, Institute of Environmental Sciences, 940 E. Northwest Highway, Mt. Prospect, IL 60056.

**Apr 21-28 Hanover Fair**, Hanover Fairgrounds, Hanover, West Germany, showcasing complete business communications systems, telex and facsimile equipment, telecommunications systems for distributed data processing networks, intercommunications systems plus radio and cable communications equipment. Hanover Fairs Information Center, Box 338, Whitehouse, NJ 08888, (201) 534 (800) 526-5978.

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# BOOK REVIEWS

## Computer Word Processing: Do You Want It?

by R. Dean Boyer  
Que Corp., Indianapolis, IN

Reviewed by James C. Graves, Jr.

This book is primarily intended as a guide for those thinking about implementing word processing into their business. However, it will serve as a very good word processing introduction for anyone. The author introduces the subject through a discussion of the word processor and software used to write the book. Then he proceeds to discuss the individual elements of the field.

The beginning chapters provide some background information on basic elements. The first word processors—smart typewriters—are compared and contrasted with current models. For example, the smart typewriters display only a few lines of text, while word processors available today will display from a single paragraph to a full page of text material on a CRT terminal.

A chapter discussing all three types of printer (thermal, dot matrix and letter-quality) includes illustrations of each type.

One chapter discusses software in detail. A thorough examination of editor functions such as wordwrap, cursor movement, search and block moves reiterates the value of good editor software.

Two chapters provide checklists for comparing word processors. A list of features suggests that such things as cursor movement, insertion/deletion, search/replace and block operations be compared. A word processor evaluation scoresheet helps determine whether or not a system is easy to use.

Pictures and illustrations add support to the material. Glossaries of computer and word processing terms define basic jargon.

148 pages \$14.95

## The Microchip: Appropriate or Inappropriate Technology?

by Alan Burns  
Halstead Press (John Wiley), New York, NY

Reviewed by Dennis Doonan

This book describes the development of microcircuits and their social and economic implications. Microelectronic applications in business, technology and personal use are illustrated to show their impact on the individual and society.

The author evaluates the role of technology in society in the hope of achieving a mutual understanding between the responsible technician and the consumer.

The book offers several views of the future based on the social implications of the microchip. The optimistic view suggests that continued technological growth will result in freely-adapted social changes. The pessimistic view implies that continued technological growth will not result in the corresponding social changes. The author espouses a third view, in which continued technological growth is not inevitable, but will reflect social needs. He pictures technology as an evolutionary—rather than revolutionary—process that must be studied and appreciated for its social benefits. Criteria for the study of the socially useful aspects of microelectronics are presented in the hope of eliminating harmful and inappropriate effects.

The development of the computer and the microprocessor is described in an overview showing the social and economic

implications of the devices. Areas of potential discord caused by these technologies are described in the fields of employment, the individual, education and the media.

While this volume will hold little interest for the home computer or small business user, it will be beneficial to the computer scientist, technologist or the sociologist interested in social ramifications of microcomputers.

180 pages \$39.95

## Simple Basic Programs for Business Applications

by J.R.F. Alonso  
Prentice-Hall, Englewood Cliffs, NJ

Reviewed by David Marca

This book is probably the most well-documented collection of mathematical calculation procedures to be found. The entire program suite is simple enough to run on any current minicomputer or microcomputer system with Basic. The coverage is extensive: probability, statistics, distributions, regressions, correlations, variance analysis, loans and interest calculations.

A brief mathematical treatment of each calculation is given, together with appropriate references. Graphs, pictures and formulas accompany each description. Sample output is given for most of the programs. Complete program listings are provided for each calculation.

The reader can enter the programs into his computer system by hand, or he can buy them from the publisher. The book claims that only magnetic tapes for minicomputer systems are available, but see if they have the software suite on floppy disks too. The businessman should try to purchase the program suite. This will result in savings in keying in the programs, then debugging after entry. The student of mathematics will find the programs interesting to enter, run and modify. What better way to learn about the principles of numerical calculation?

297 pages \$7.95

## Computers and Medicine

by Vernon Sondak, Howard Schwartz, M.D.  
and Norman Sondak  
Artech House, Dedham, MA

Reviewed by Rocky Smolin

This is a collection of 32 articles by medical professionals drawn from medical journals. As such, one would expect to find generally dry, overly technical and obscure medical dissertations. Instead, the reader is pleasantly surprised, not only by the clarity and comprehensibility of most of the articles, but by the interest they generate and the substantial amount of information they impart.

The first section deals with the interaction of the computer, patient and doctor. The section on computers in medical education covers such topics as computer-assisted surgery, and computer-aided instruction (CAI) for medical students.

Another section explores computer-aided medical decision making in diagnosis, potential suicide identification, and analysis of pre-operative variables for peptic ulcer patients.

The last chapter covers computers in clinical laboratories and how they are assisting in the execution and analysis of laboratory procedures, while reducing errors and costs.

Each chapter is preceded by comments designed to present an overview and orientation for the material in that chapter. Overall, the authors have compiled a fascinating view of how computers are impacting the many areas of medicine.

245 pages \$35

**Program for a Puppet**  
by Roland Perry  
**Pocket Books, New York, NY**  
Reviewed by Leigh E. Zeitz

Assassination, computer smuggling, soviet espionage and a computer-designed plan to place a company man from the world's largest multi-national enterprise, Lasercomp, into the office of President of the U.S. are all part of the international intrigue in this novel. The hero, Edwin Graham, is caught in a "David vs. Goliath" battle after he discovers Lasercomp's plans to use its latest product, Cheetah—the ultimate computer, to take control of the world. Graham must expose the scheme without first getting killed.

This book is well-written. Perry has the unique ability to effectively interweave concurrent subplots clearly and logically, so as not to confuse the reader.

Though the book is fiction, it is not all far-fetched. "Every computer function described in the story has either happened or is happening today," explains Perry in his preface. It is the accuracy in his depiction of computer capabilities that sets this novel apart from other science fiction stories. There is no omnipotent computer that runs amok and conquers the world. The computer is used as a tool by a power-hungry old man. The electronic surveillance, the computer-analyzed election campaign, and the dialogues with the Cheetah computer are all believable.

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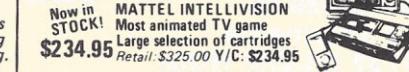
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**Explore Computing with the TRS-80**  
by Richard V. Andree and Josephine P. Andree  
Prentice-Hall, Inc., Englewood Cliffs, NJ

Reviewed by David D. Busch

This textbook, prepared by two educators at the University of Oklahoma, presents an interesting introduction to Basic programming with the TRS-80. It was designed to be used for self-instruction—with or without a teacher's assistance.

In classic textbook form, the authors present concepts, self tests, and problems for solution in easy-to-digest morsels. The first four lessons form an introduction to the TRS-80's capabilities in Basic, and may be skimmed or read rapidly by those who already have some familiarity with the computer. The rest of the book deals with 75 micro-research problems, which present interesting challenges to those with any skill level.

The book's scope is ambitious; it tries to be everything to everyone, from grade five through adult business person. Adults and the very young may have some problems with the more difficult assignments. However, the authors have tested every single problem, and found that they can be solved by students with no more than ninth grade mathematical skill.

One chapter is devoted to the special graphics capabilities of the TRS-80. Most of the others contain material that also applies to other computers using a similar form of Microsoft Basic—such as the Apple and Pet.

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**Some Common Basic Programs****TRS-80 Level II Edition**by Lon Poole, Mary Borchers and Karl Koessel  
Osborne/McGraw-Hill, Berkeley, CA

This venerated volume of 76 practical programs is now available for the TRS-80 models I and III. It consists of a collection of plain-vanilla software that can be entered by the user and run on a bare-bones 4K TRS-80.

These are not complex programs. Most are single-function modules designed to perform a given calculation or task. There are no games, data base managers or other lengthy items. The programs break down into three basic types. A few are personal or general purpose programs, which find the day of the week, convert fractional to metric or figure the cost of a recipe.

Some others will be useful for business people who want to figure the value of an investment or annuity, or calculate interest rates. The majority of the programs in this book deal with math and statistical problems. If you are heavily into chi-square distribution or plotting polar equations, this book is a goldmine.

Even if you are interested only in one of the three basic types of software presented, you should find a few that are worth the cost of the book. I'd recommend that you look over the table of contents carefully, and if you find something you like, buy it. These programs have been around for a long time, and should be bug-free.

198 pages \$14.99

—DDB

**Introduction to 8080/8085****Assembly Language Programming****A Self-Teaching Guide**by Judi N. Fernandez and Ruth Ashley  
John Wiley, New York, NY

There are those of us who have read several books on assembly language programming, and feel that we understand the concepts fairly well, yet we can't do it. This is the sort of book that just might help break down that last barrier, and turn even the staunchest nonconformist into an accomplished 8080 or 8085 assembly language programmer. In fact, I recommend this guide for those Z-80 users who may have been having trouble comprehending that more advanced chip's huge instruction set. I found that after reading this book, I was better prepared to tackle Z-80 assembly language once again.

The authors seem to explain the basic concepts more clearly, so that the beginner doesn't get lost early in the game. As the going gets tougher, lucid examples and interesting tests ensure that interest and comprehension remain high.

The authors explore input/output, data movement, various types of operations, and register and stack manipulations. Those using 8080 or 8085-based computers will be able to use what they have learned immediately. Fledgling assembly language programmers working with the Z-80 chip will find that this book makes a good primer before taking on the more complex instruction sets of their microprocessor.

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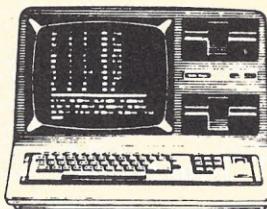
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## Game Corner

Continued from page 22



### Listing 1

```
10 REM FOG INDEX (1) NOV '81
100 FOR RAM=....TO....
110 : LE$=CHR$(PEEK(RAM))
120 : PRINT LE$;
130 : IF LE$<>" " THEN 170
140 : IF WL>8 THEN CC=CC+1
150 : IF WL>0 THEN WC=WC+1
160 : WL=0:GOTO 200
170 : IF ASC(LE$)<>46 THEN 190
180 : SE=SE+1:GOTO 140
190 : WL=WL+1
200 NEXT RAM
210 :
220 :
230 :
650 RL=.4*(WC/SE+CC*100/WC)
660 :
700 FOR B=1TO5:PRINT:NEXT
710 PRINT" ";WC;" Words.":PRINT
720 PRINT" ";SE;" Sentences.":PRINT
730 PRINT" ";CC;" Words with 3":PRINT
740 PRINT" " or more syllables."
750 PRINT:PRINT:RL=INT(RL*10+.5)/10
760 PRINT" Reading level is about"
770 PRINT:PRINT" Grade ";RL
997 :
998 PRINTCHR$(7)
999 END
```

### Listing 2

```
1 REM FOG INDEX NOV '81
5 CLEAR
```

```
10 W3=0:WC=0:SE=0:WL=0:SY=0:RL=0
20 LE$="":PLE$="":VW$=""
40 V$="aeiouAEIOUYy"
50 :
100 FOR RAM=....TO....
120 : LE$=CHR$(PEEK(RAM))
140 : PRINT LE$;
150 : GOSUB 500
160 : IF LE$<>" " THEN 240
220 : GOTO 260
240 : IF ASC(LE$)<>46 THEN 280
245 : IF WL>0 THEN SE=SE+1
246 : PLE$="NOT VOWEL"
260 : IF WL>0 THEN WC=WC+1
264 : SY=0:WL=0:GOTO 300
280 : WL=WL+1
300 NEXT RAM
301 :
305 GOTO 650
310 :
320 :
500 IF SY>2 THEN 600
510 FOR CT=1 TO 12
520 : VW$=MID$(V$,CT,1)
525 : IF LE$=VW$ THEN 570
530 NEXT CT
560 PLE$="NOT VOWEL":GOTO 600
570 IF PLE$="VOWEL" THEN 600
580 PLE$="VOWEL"
590 SY=SY+1:IF SY=3 THEN W3=W3+1
600 RETURN
640 :
650 RL=.4*(WC/SE+W3*100/WC)
660 :
700 FOR B=1TO32:PRINT:NEXT
710 PRINT" ";WC;" Words.":PRINT
720 PRINT" ";SE;" Sentences.":PRINT
730 PRINT" ";W3;" Words with 3":PRINT
740 PRINT" " or more syllables."
750 PRINT:PRINT:RL=INT(RL*10+.5)/10
760 PRINT" Reading level is about"
770 PRINT:PRINT" Grade ";RL
997 :
998 PRINTCHR$(7)
999 END
```

### Listing 3

```
1 REM LISTING (3) NOV '81
5 CLEAR
10 W3=0:WC=0:SE=0:WL=0:SY=0:RL=0
20 LE$="":PLE$="":VW$=""
30 FL$="TRUE"
40 V$="aeiouAEIOUYy"
```

```

50 :
100 FOR RAM=....TO...
120 : LE$=CHR$(PEEK(RAM))
140 : PRINT LE$:
150 : GOSUB 500
160 : IF LE$<>" " THEN 240
200 FL$="TRUE"
220 : GOTO 260
240 : IF ASC(LE$)>46 THEN 280
245 : IF WL>0 THEN SE=SE+1
246 : PLE$="NOT VOWEL"
260 : IF WL>0 THEN WC=WC+1
264 : SY=0:WL=0:GOTO 300
280 : WL=WL+1
300 NEXT RAM
301 :
305 GOTO 650
310 :
320 :
500 IF SY>2 THEN 610
510 FOR CT=1 TO 12
520 : VW$=MID$(V$,CT,1)
525 : IF LE$=VW$ THEN PLE$="VOWEL":GOTO 600
530 NEXT CT
570 IF PLE$="NOT VOWEL" THEN 610
580 PLE$="NOT VOWEL"
590 SY=SY+1:IF SY=3 THEN W3=W3+1
600 IF FL$="TRUE" THENSY=1:PLE$="NOT VOWEL"
610 FL$="FALSE":RETURN
640 :
650 RL=.4*(WC/SE+W3*100/WC)
660 :
700 FOR B=1 TO 32:PRINT:NEXT
710 PRINT " ;WC;" Words.:" :PRINT
720 PRINT " ;SE;" Sentences.:" :PRINT
730 PRINT " ;W3;" Words with 3":PRINT
740 PRINT " or more syllables."
750 PRINT:PRINT:RL=INT(RL*10+.5)/10
760 PRINT" Reading level is about"
770 PRINT:PRINT" Grade ";RL
797 :
998 PRINTCHR$(7)
999 END

```

#### Listing 4

```

10 ' FOG INDEX FOR TRS-80 DISK FILES
20 CLS: PRINT "THIS PROGRAM WILL COMPUTE THE"
30 PRINT "FOG INDEX OF ANY ASCII DISK FILE."
40 CLEAR 1000
50 DIMW$(256): N=0: LTR=0: WRD=0: BIG=0: SEN=0
60 INPUT "FILENAME ";F$: OPEN "I", 1, F$
70 IF EOF(1) THEN CLOSE: GOTO 280
80 LINE INPUT#1,A$:N=LEN(A$): IF N=0 GOTO 70
90 FOR I=1 TO N: W$(I-1)=MID$(A$,I,1): NEXT: N=N-1
100 ' W$ ARRAY STORES EACH LETTER OF THE LINE
110 CLS: FOR J=0 TO N: PRINT W$(J);: NEXT
120 FOR J=0 TO N: PRINT @J, CHR$(191);
130 IF W$(J)>="A" THEN LTR=LTR+1: GOTO 250
140 IF W$(J)<>" " THEN GOTO 210
150 IF W$(J+1)=" " THEN GOTO 210

```

```

160 ' COUNT NEW WORD FOR SINGLE SPACE OR
170 ' LAST SPACE OF MULTIPLE SPACES
180 WRD=WRD+1
190 IF LTR>8 BIG=BIG+1
200 LTR=0
210 IF W$(J)=". " THEN SEN=SEN+1
220 IF W$(J)="!" THEN SEN=SEN+1
230 IF W$(J)="?" THEN SEN=SEN+1
240 IF W$(J)="-" THEN SEN=SEN+1
250 PRINT@J, W$(J);:NEXT J
260 IF W$(N)<>" " THEN WRD=WRD+1
270 GOTO 70
280 FOG=.4*((WRD/SEN)+(BIG/WRD)*100):PRINT
290 PRINT SEN;" SENTENCES "
300 PRINT WRD;" WORDS "
310 PRINT WRD/SEN;" WORDS PER SENTENCE "
320 PRINT BIG;" WORDS OVER 8 LETTERS LONG"
330 PRINT BIG/WRD*100;" % WORDS OVER 8 LETTERS LONG"
340 PRINT "FOG INDEX=";FOG
350 END

```

#### Sample run

```

47 SENTENCES
933 WORDS
19.8511 WORDS PER SENTENCE
44 WORDS OVER 8 LETTERS LONG
4.71597 % WORDS OVER 8 LETTERS LONG
FOG INDEX= 9.82682
READY
>
>PROGRAM OUTPUT FOR TEXT OF THIS MONTH'S ARTICLE.

```

#### Listing 5

```

5 'BRLAKOUT
10 A=0: 'BALLS USED
15 S=0: 'SCORE
20 CLS0
30 FOR X=0 TO 63
40 FOR Y=4 TO 12 STLN 2
50 SLT(X,Y,RND(6)+2) '20-60 DRAWS WALL
60 NLXTY,X: 'INITIAL BALL POSITION
70 X=30: Y=13: 'IF Q=0 BALL MOVES RIGHT
80 Q=RND(2)-1: 'IF W=0 BALL MOVES DOWN
90 W=0: '4 BALL MAXIMUM
100 IF A=4 TRLN END 'READ JOY STICK
110 D=JOYSTK(0):
120 IF D<2 THEN D=2
130 IF D>61 THEN D=61: 'KLLP PADDLE ON SCREEN
140 FOR F=D-2 TO D+2
150 SLT(F,31,1)
160 NEXT F: '140-160 DRAW PADDLE
170 IF X>61 THEN Q=1: 'START BALL MOVING RIGHT
180 IF X<2 THEN Q=0: 'START BALL MOVING LEFT
190 IF Y>28 THEN W=1: 'START BALL MOVING UP
200 IF Y<4 THEN W=0: 'START BALL MOVING DOWN
210 RESET(X,Y): 'ERASE BALL
220 IF Q=1 THEN X=X-(RND(2)) '220-260 NW BALL LOCATION
230 IF Q=0 THEN X=X+(RND(2))
240 IF W=1 THEN Y=Y-2
250 IF W=0 THEN Y=Y+2
260 IF Y>28 THEN Y=30
270 ' PRINT @1,"SCORE="S "SHOTS LEFT="3-A
280 IF POINT(X,Y+1)=1 THEN 100: 'BALL HIT PADDLE
300 FOR F=D-2 TO D+2
310 RLSET(F,31)
320 NEXT F: '300-320 ERASL PADDLE
330 IF POINT(X,Y)>2 THEN 500: 'BALL HIT WALL
340 IF Y<30 THEN 400
350 'FALLS THROUGH IF BALL MISSLS PADDEL
360 A=A+1: 'NLXT BALL
370 FOR X=1 TO 10
380 SOUND 1,1: NEXT X: 'MISSLES BALL SOUND
390 GOTO 70
400 SLT(X,Y,2): GOTO 100
500 'HIT WALL
510 W=-W+1: 'CHANGE 0 TO 1 AND VISA VERSA
520 S=S+13-Y: 'INCREASL SCORE
530 RESET(X,Y): 'ERASL BRICK
540 SOUND 200-(10*Y),1
550 GOTO 100

```

## Commodore Logbook

Continued from page 51

### Sample worksheet

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#### CONSOLIDATED REPORT

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<b>Gross Billng's</b>									
Client 1	240000.00	240000.00	240000.00	240000.00	240000.00	240000.00	1440000.00	Client 1	0.15
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Client 3	837000.00	837000.00	837000.00	837000.00	837000.00	837000.00	5022000.00	Client 3	0.10
Client 4	625037.00	625037.00	625037.00	625037.00	625037.00	625037.00	3750222.00	Client 4	0.15
Client 5	497375.00	497375.00	497375.00	497375.00	497375.00	497375.00	2984250.00	Client 5	0.15
Client 6	257000.00	282700.00	310970.00	342067.00	376273.70	413901.07	1982911.77	Client 6	0.15
Client 7	985000.00	985000.00	985000.00	985000.00	985000.00	985000.00	5910000.00	Client 7	0.15
Client 8	253000.00	258060.00	263221.20	268485.62	273855.34	279332.44	1595954.60	Client 8	0.20
Client 9	829000.00	829000.00	829000.00	829000.00	829000.00	829000.00	4974000.00	Client 9	0.15
Client 10	957000.00	957000.00	957000.00	957000.00	957000.00	957000.00	5742000.00	Client 10	0.15
Tot. Billings	5582987.00	5618875.75	5657692.14	5699708.01	5745221.59	5794560.09	34099044.58		
<b>Revenue</b>									
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Client 7	147750.00	147750.00	147750.00	147750.00	147750.00	147750.00	886500.00		
Client 8	50600.00	51612.00	52644.24	53697.12	54771.07	55866.49	319190.92		
Client 9	124350.00	124350.00	124350.00	124350.00	124350.00	124350.00	746100.00		
Client 10	143550.00	143550.00	143550.00	143550.00	143550.00	143550.00	861300.00		
Tot. Revenue	808248.05	813884.36	819964.88	826530.48	833626.01	841300.64	4943554.42		
<b>Salaries</b>									
Officers	95000.00	95000.00	95000.00	95000.00	95000.00	95000.00	570000.00		
Creative	62000.00	62000.00	62000.00	65000.00	65000.00	65000.00	381000.00		
Act. Svcs	15000.00	15000.00	15000.00	15000.00	15000.00	15000.00	90000.00		
Adminst.	12000.00	12000.00	12000.00	12000.00	12000.00	12000.00	72000.00		
Media	11000.00	11000.00	11000.00	11000.00	11000.00	11000.00	66000.00		
R/TV Prod.	8700.00	8700.00	9500.00	9500.00	9500.00	9500.00	55400.00		
Research	7000.00	7000.00	7000.00	7000.00	7000.00	7000.00	42000.00		
R/TV Business	8300.00	8300.00	8300.00	8300.00	8300.00	8300.00	49800.00		
Traffic	7200.00	7200.00	7200.00	7200.00	7200.00	7200.00	43200.00		
Technical	9600.00	9600.00	9600.00	9600.00	9600.00	9600.00	57600.00		
Tot. Salaries	235800.00	235800.00	236600.00	239600.00	239600.00	239600.00	1427000.00		

Worksheet continues on page 152



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**Sample worksheet (continued)****Persnl. Costs**

Freelance	3000.00	3200.00	2750.00	3150.00	3700.00	3400.00	19200.00
Freelance Art	7200.00	7300.00	7500.00	7200.00	7500.00	6700.00	43400.00
Freelance Cpy	10000.00	9700.00	11000.00	9800.00	12000.00	8500.00	61000.00
Temp. Help	2000.00	1500.00	1700.00	1900.00	2100.00	2150.00	11350.00
Media Svcs.	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	6000.00
Ofc. Life Ins	2500.00	2500.00	2500.00	2500.00	2500.00	2500.00	15000.00
Payroll Tax	3600.00	3600.00	3600.00	3600.00	3600.00	3600.00	21600.00
Group Ins.	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	30000.00
Emp Agcy Fee	750.00	750.00	750.00	750.00	750.00	750.00	4500.00
Tot. Persnl.	35050.00	34550.00	35800.00	34900.00	38150.00	33600.00	212050.00

**Occupance**

Rent	3000.00	3000.00	3000.00	3000.00	3000.00	3000.00	18000.00
Tax	600.00	600.00	600.00	600.00	600.00	600.00	3600.00
Utilities	450.00	450.00	450.00	450.00	450.00	450.00	2700.00
Amortization	1200.00	1200.00	1200.00	1200.00	1200.00	1200.00	7200.00
Tot. Occupance	5250.00	5250.00	5250.00	5250.00	5250.00	5250.00	31500.00

**Trvl. & Prmtn**

Travel	3000.00	3000.00	3200.00	3300.00	3200.00	3500.00	19200.00
Entertainment	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	6000.00
Local Fares	250.00	250.00	250.00	250.00	250.00	250.00	1500.00
PR	2000.00	2200.00	2500.00	1800.00	2100.00	2300.00	12900.00
Tot. Tvl/Pmt	6250.00	6450.00	6950.00	6350.00	6550.00	7050.00	39600.00

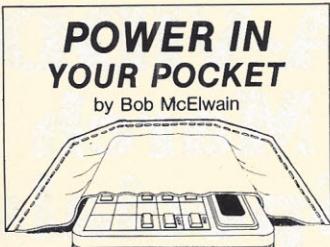
**Research**

Research	2500.00	2500.00	2500.00	2500.00	2500.00	2500.00	15000.00
Client c/o	5000.00	4500.00	5700.00	5500.00	5800.00	4300.00	30800.00
New Business	2750.00	2750.00	2750.00	2750.00	2750.00	2750.00	16500.00
R/TV Expenses	7500.00	7500.00	7500.00	7500.00	7500.00	7500.00	45000.00
Tot. Research	17750.00	17250.00	18450.00	18250.00	18550.00	17050.00	107300.00



## Power in Your Pocket

Continued from page 53



### Program listing

5: PRINT "MOVING AVERAGE"  
- A is the maximum number of elements that memory can hold. Set A to the number of memories available with the program loaded, plus 14. (12 program variables are used). B is the offset for indexing A. On Casio delete all reference to B or set B to zero.  
10: A=54: B=12  
15: PAUSE "OPTIONS FOLLOW. ENTER"  
20: PAUSE "ANY CHAR TO SELECT"  
25: INPUT "ADD DATA? ";I\$: GO TO 100  
30: INPUT "RUN AVES? ";I\$: GO TO 300  
35: INPUT "EDIT DATA? ";I\$: GO TO 400  
40: GO TO 15  
    @@@ ADD DATA @@@  
100: PRINT "ADD DATA"  
105: PAUSE "EXIT ON ZERO"  
- If array is full, go to use the last position.  
110: IF C=A THEN 145  
- Add a data item to the next available position.  
115: E=B+C+1: INPUT "NEW? ";A(E)  
- Exit if zero.  
120: IF A(E)=0 THEN 15  
- Display for approval.  
125: PRINT "NEW IS ";A(E)  
- Return for re-entry on any character.  
130: INPUT "OK? ";I\$: GO TO 115  
- Increase count of elements in use.

135: C=C+1  
- Go to compute latest average.  
140: GO TO 190  
- Here if will use last data position. Begin by rolling data back. The first element is discarded.  
145: PRINT "DO NOT BREAK"  
150: FOR E=B+2 TO B+C  
155: A(E-1)=A(E)  
160: NEXT E  
165: PRINT "BREAK OK"  
- Get new data item.  
170: E=B+C: INPUT "NEW? ";A(E)  
- Exit on zero. Set counter back one.  
175: IF A(E)=0 LET C=C-1: GO TO 15  
- Display for approval.  
180: PRINT "NEW IS ";A(E)  
- Return for re-entry on any character.  
185: INPUT "OK? ";I\$: GO TO 170  
- Find number of periods to average. If zero (a start), set to one. Actual number to be used must be set in edit routine.  
190: F=D: IF F=0 LET F=1  
- If the number of data items loaded is less than the requested number to be averaged, use the present number of data items.  
195: IF F>C LET F=C  
- Accumulate for average.  
200: G=0  
205: FOR E=B+C-F+1 TO B+C  
210: G=G+A(E)  
215: NEXT E  
- Compute and round average to hundredths.  
220: G=INT(G/F\*100+.5)/100  
225: PRINT F;"DAY AVE IS ";G  
- ENTER only for another entry.  
Exit on any character.  
230: INPUT "ANOTHER? ";I\$: GO TO 15

# THE VIDEO-COMPUTER INTERFACE

*Get it in*

# VIDEOPLAY

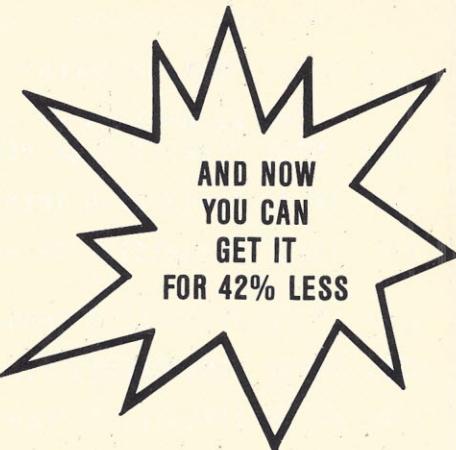
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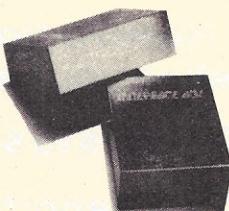
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```

235: GO TO 105
    @@@ RUN AVERAGES @@@
300: PRINT "RUN AVERAGES"
    - Get parameters of run.
305: INPUT "LOWEST # OF PERS? ";J
310: IF (J<1)+(J>C)>0 THEN 305
315: INPUT "HIGHEST # OF PERS? ";L
320: IF (L<J)+(L>C)>0 THEN 315
325: INPUT "INCREMENT? ";H
330: IF (H<1)+(H>L)>0 THEN 320
    - Loop per parameters entered
    above.
335: FOR F=J TO L STEP H
    - Loop through the data for
    averages of F periods.
340: FOR K=B+1 TO B+C-F+1
    - Accumulate F periods for average,
    beginning with item K.
345: G=0
350: FOR E=K TO K+F-1

```

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```

355: G=G+A(E)
360: NEXT E
    - Compute average and round to
    hundredths.
365: G=INT(G/F*100+.5)/100
    - Change to PAUSE for continuous
    display.
370: PRINT K-B;" ";F;"DAY AVE IS ";G
375: NEXT K
380: NEXT F
385: GO TO 15
    @@@ EDIT DATA @@@
400: PRINT "EDIT DATA"
    - Display number of periods to
    be averaged for possible
    change.
405: PRINT "# OF PERS IS ";D
    - ENTER only if no change
    required.
410: INPUT "OK? ";I$: GO TO 420
415: GO TO 430
    - Change number of periods.
420: INPUT "NEW # OF PERS? ";D
425: GO TO 405
430: PAUSE "EXIT ON ZERO"
    - Loop through data set. J is
    count of data items in use.
440: J=0
445: J=J+1
    - Display present data.
450: E=B+J:PRINT"PER ";J;" DATA=";A(E)
    - Leave unchanged if ENTER only.
455: INPUT "NEW? ";A(E)
    - Exit on zero.
460: IF A(E)=0 LET J=J-1: GO TO 475
    - Continue if maximum not
    reached.
465: IF J<A THEN 445
470: PRINT "ARRAY IS FULL"
    - If count greater than original
    count, save the new count.
475: IF J>C LET C=J
480: GO TO 15
999: END

```

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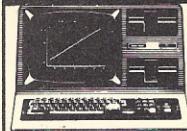
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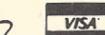
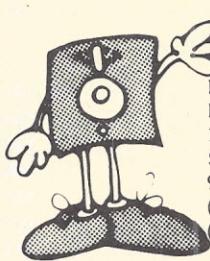
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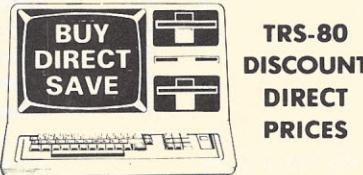
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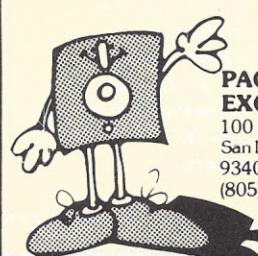
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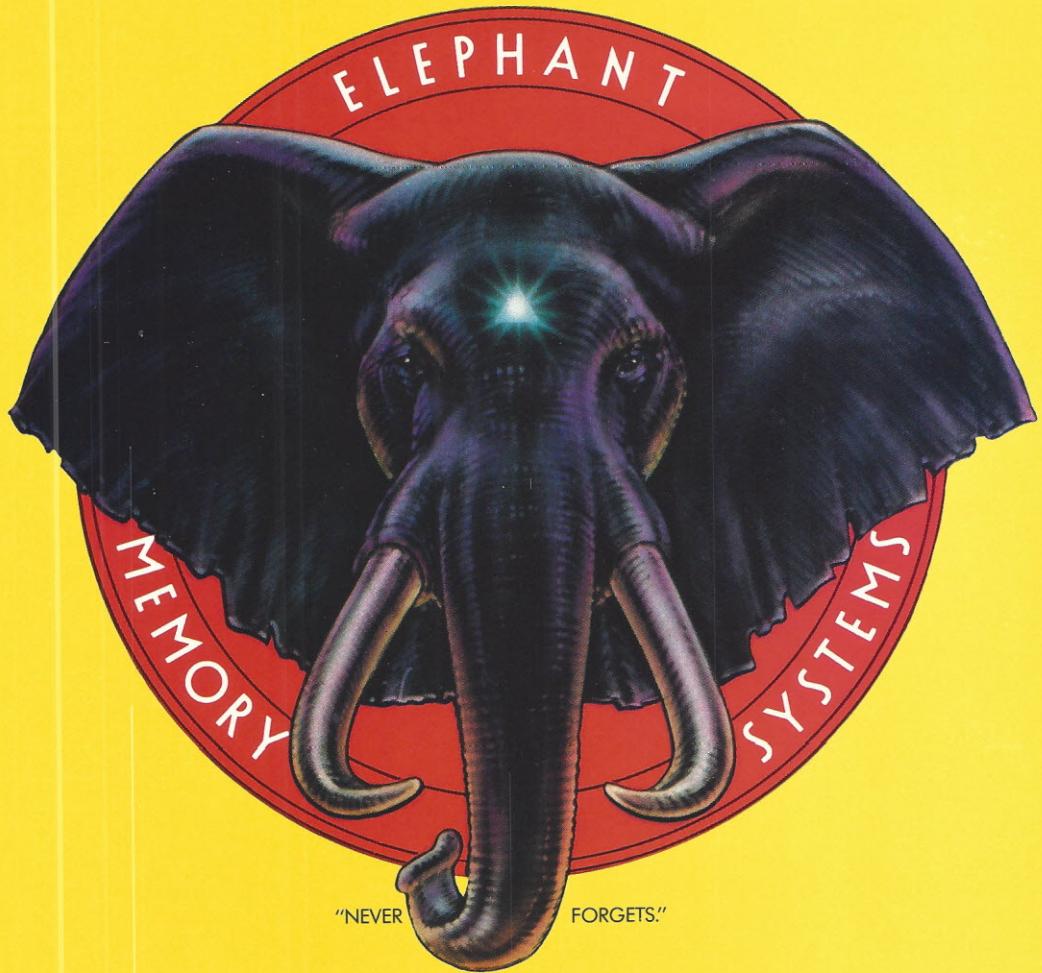
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Info Inquiry Number	Page	Info Inquiry Number	Page
<b>MANUFACTURERS</b>			
1 AEI . . . . .	7	60	Micropro International . . . . .
2 Amdek . . . . .	BC	63	Muse . . . . .
3, 4 Anvil Cases . . . . .	98, 99	65	Net Profit Computer . . . . .
5 Ashton Tate . . . . .	107	66	New England Business Service . . . . .
6 Aspen Software Co. . . . .	130	68	North America Mica . . . . .
7 Association of Computer Users . . . . .	61	69	PCE Systems . . . . .
8 Atari . . . . .	14, 15	*	Peachtree Software . . . . .
9 Atsuko Computing International . . . . .	64	71	Personal Computer Owners, Inc. . . . .
10 Avant Garde . . . . .	117	118	Phase One . . . . .
11, 12 Bausch & Lomb . . . . .	13	72	Philadelphia Consulting Group, Inc. . . . .
13 John Bell Engineering . . . . .	38	73	Pickles & Trout . . . . .
14, 15 CMC International . . . . .	37, 105	74, 78	Pi-Tech . . . . .
16 Cermetek . . . . .	108	75	Racet Computes . . . . .
17 Columbia Data Products . . . . .	41	76	Radio Shack . . . . .
18 Commodore Computer . . . . .	67	77	Rocky Mountain Software . . . . .
19, 20 Compumax . . . . .	28, 83	*	Sierra Data Services . . . . .
21 Compuserve . . . . .	4	79, 80	Sinclair Research . . . . .
22 Computer Furniture & Accessories . . . . .	12	81	Standard Software . . . . .
23 Computer Services Corporation of America . . . . .	9	82	Supersoft Associates . . . . .
24 Computer Shopping Center . . . . .	27	83	Systems Plus . . . . .
25 Condor Computer . . . . .	35	84	TCS Software . . . . .
26 Cornucopia . . . . .	23	85	Tarbell Electronics . . . . .
27 Cromemco Inc. . . . .	1	86	Teletek . . . . .
*	Cybernetics . . . . .	48	Transnet . . . . .
*	Data Dynamics Technology . . . . .	95, 103, 112, 113, 156	Univair . . . . .
28 D & W Digital . . . . .	82	88	University Microfilms . . . . .
29 Datacast . . . . .	157	89	Versa Computing . . . . .
30 Data Tech Reliance . . . . .	50	90	Video Play Magazine . . . . .
31 Digital Graphic Systems . . . . .	30	91	Vista . . . . .
32 Dilithium Press . . . . .	51	92	Wildfire Publishing . . . . .
33 Discount Software Group . . . . .	66		Wiley Professional Software . . . . .
34, 39 Dynabyte . . . . .	83, 109		
35 Ecosoft . . . . .	50	93	<b>RETAIL</b>
36 Electronic Control Technology . . . . .	46	94	American Square . . . . .
37 Electronic Specialists . . . . .	53	95	Avidd Electronics . . . . .
38 Ellis Computing . . . . .	75	96	The CPU Shop . . . . .
*	Epson America . . . . .	10, 11	Computer Discount of America . . . . .
40 Freedom Technology . . . . .	123	98	Computer Tutor . . . . .
41 General Datacom . . . . .	111	99	Cornerstone . . . . .
42, 117, 44 Hayes Microcomputer . . . . .	4, 20, 26	101	Eclectic Systems . . . . .
45 Howard Software Services . . . . .	6	102	Marymac . . . . .
46 Independent Peripherals . . . . .	46	103	Micro Business World . . . . .
47 Infosoft . . . . .	5	104	Olympic Sales . . . . .
48 Integrand . . . . .	135	105	Pan American Electronics . . . . .
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57 3M Static Control . . . . .	21	113	Pacific Exchanges . . . . .
58 Charles Mann & Associates . . . . .	38	114	Stok Computer Interface . . . . .
*	Media Mix . . . . .	129	Vynet . . . . .
59 Microcraft Inc. . . . .	19		

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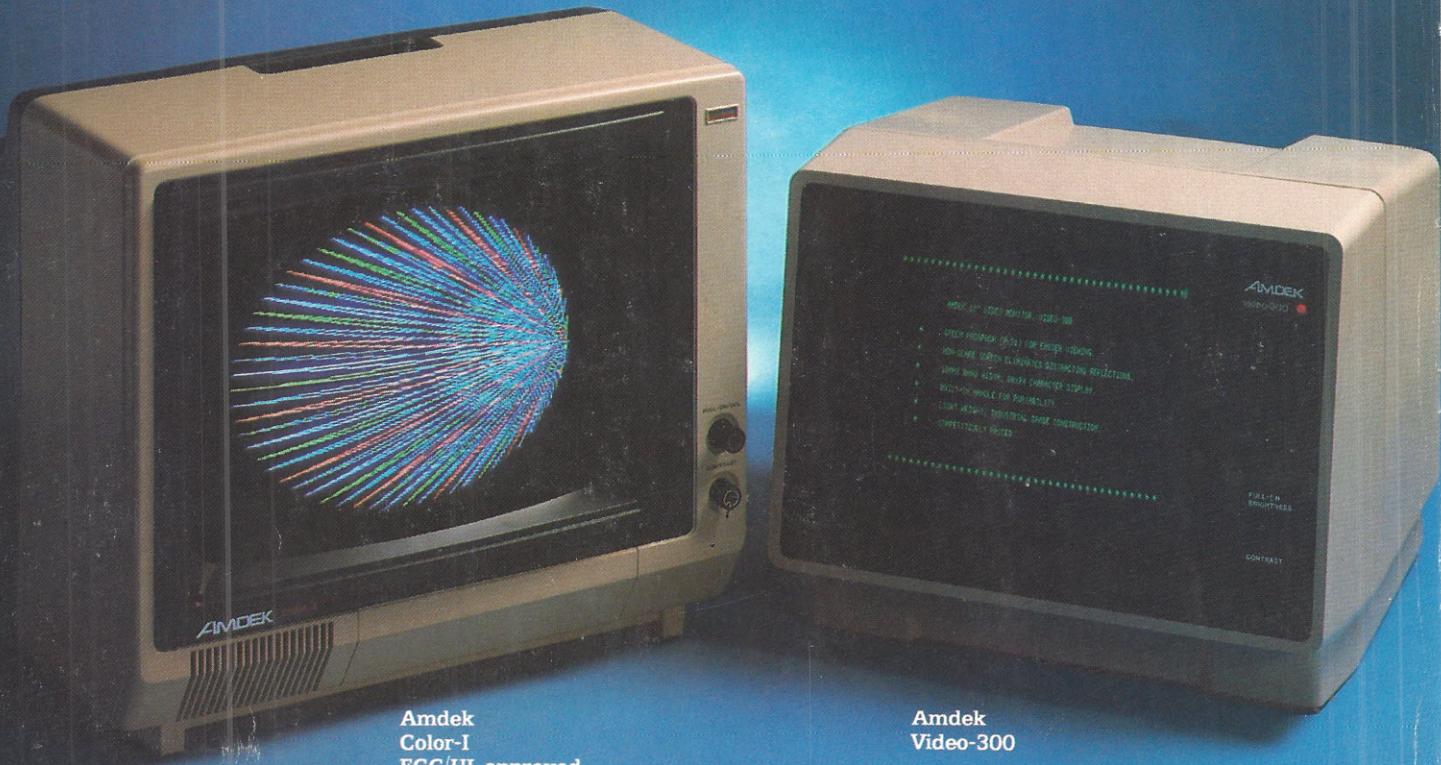
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